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EFFECT OF AGRICULTURAL LAND DEVELOPMENT ON DRAINAGE WATERS IN THE NORTH CAROLINA TIDEWATER REGION

by

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School of Agriculture and Life Sciences
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ABSTRACT

A three year study was conducted to determine the effects of agricultural drainage and development on hydrology and runoff water quality on high organic soils in the North Carolina Tidewater Region. Experiments were conducted on paired developed and undeveloped sites of three different soils that span the range of soils being developed in the Tidewater Region. Each of the six sites (three developed, three undeveloped) were instrumented to continuously measure the rate of runoff, to sample for water quality and pesticide analyses, and to determine other variables such as rainfall and water table depth.

Peak runoff rates occur earlier and are three to four times higher on developed than on similiar undeveloped lands. However, because of limited capacity of current canals, there may be little difference between runoff rates from developed and undeveloped lands during the largest runoff events. In general, development causes a decrease in evapotranspiration (ET) with a consequent small increase in annual outflows.

There is a small but significant increase in inorganic nitrogen in drainage water as a result of agricultural development of these organic rich soils. However, the true organic soils which are developed lose considerably more phosphorus to drainage waters. Development of the mineral soil has a very small effect on phosphorus losses.

Agricultural development results in a small increase in sediment load of drainage waters and turbidity also increases, particularly during the developmental phase. Dissolved oxygen, biochemical oxygen demand, temperature, pH, and other water quality parameters are measurably affected by development, but the changes are relatively small. Other parameters that change but have no apparent effect on water quality are Ca, Mg, K, Na, and Cl concentrations.

One potential water quality problem is the movement of fecal organisms from grazed pastures into drainage waters. A significant increase in the loss of fecal and total coliform bacteria was observed from the pastured site. Pasture sites in this study are located several miles from estuarine waters and transport of the coliform

organisms was not examined in sufficient detail to determine if they cause water quality problems in receiving estuaries.

The distribution and persistence of alachlor in high organic soils of the Tidewater Region of North Carolina and the contamination of drainage water were investigated over a 3-year period. Alachlor disappears rapidly from soil during the first 4 weeks after application; but low, nonphytotoxic concentrations persist from one season to the next. Concentrations of alachlor in water from drainage ditches interspersed in treated fields vary greatly among sites and years. High concentrations (ppm levels) appear to be caused by direct spraying of the ditches or by drift of sprays into the ditches. Movement in surface runoff does not appear to be a major route of water contamination.

Drainage systems currently installed in the organic and high organic mineral soils provide mostly surface rather than subsurface drainage. Water tables are usually close to the surface during the winter and change continuously with ET and rainfall during the growing season.

The major effects of agricultural development on soil properties involve the surface horizon (20 cm). Subsidence of the organic soils is greatest directly after development because of irreversible drying and shrinkage of soil in the root zone. After this initial period, subsidence on the deep organic pasture site is less than 1 mm/year for a three year period.

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SUMMARY AND CONCLUSIONS

A three year study was conducted to determine the effects of agricultural drainage and development on hydrology and runoff water quality on soils with high organic contents in the North Carolina Tidewater Region (the Blacklands). Experiments were conducted on paired developed and undeveloped sites of three different soils that span the range of soils being developed in the Tidewater Region (Blacklands). Each of the six sites (three developed, three undeveloped) were instrumented to continuously measure the rate of runoff, to sample for water quality and pesticide analyses and to determine other variables such as rainfall and water table depth.

Peak runoff rates occur earlier and are three to four times higher on developed than on similar undeveloped lands. As presently designed, the drainage canal network, with pump assisted outlets in some cases, does not have the capacity to remove the water at the rate that it can drain from developed fields. As a result there may be little difference between runoff rates from developed and undeveloped lands during the largest runoff events.

Total annual outflows from the developed sites were somewhat higher than from undeveloped sites during certain years of the study, but about the same in others. In general, however, development will cause a decrease in ET with a consequent increase in annual runoff during years in which drought periods occur. The increase in total runoff will usually be small but will depend on the number of drought periods that are followed by runoff producing rainfall events.

Drainage systems currently installed in the organic and high organic mineral soils provide mostly surface rather than subsurface drainage. Water tables are usually close to the surface during the winter and change continuously with ET and rainfall during the growing season. Average water table depths were about 22 cm deeper on the developed than on the undeveloped deep organic soil. Because of the influence of the root mat, water tables were actually deeper on ditched, but undeveloped mineral and shallow organic soils.

The composition of drainage water from agricultural fields in the organic and high organic soils of the Blacklands is somewhat different from other agricultural areas of North Carolina. Consequently, the effect of development of natural areas for agricultural production is different. Much less inorganic nitrogen is found in drainage water from developed fields in the Blacklands as compared to most fields further inland. This is a result of the very low nitrate levels in drainage waters from these organic rich soils. The inorganic nitrogen losses to drainage water from developed areas are greater than from natural areas, but the increase in nitrogen concentration is not as large as might be predicted based on data from other agricultural areas.

The largest potential eutrophication hazard resulting from development may be the increase in phosphorus in drainage waters. The effect of development upon phosphorus losses in drainage waters is very dependent upon soil type. Inorganic soils react with fertilizer phosphorus to prevent its loss. The solubility of phosphorus in shallow and deep organic soils is much greater than in inorganic soils, so much of the added phosphorus can be lost to drainage water. The weighted average concentration in drainage waters from the two developed organic soils was 1-2.5mg/l for a total phosphorus efflux of 7-10 kg/ha/yr. The amount of this phosphorus which reaches major stream or estuaries will depend on distance the water must travel to reach the outlet, the type of sediment in the collector ditches, and the soil material in the banks. If the sediments are from inorganic soils or the canals are cut into mineral layers, much of the inorganic orthophosphate may be removed from solution by these sediments. Fortunately, much of the current agricultural development is on mineral soils where P losses are small. However, it should be recognized that agricultural development of organic soils low in mineral content immediately adjacent to estuaries or major streams will very significantly increase the entry of phosphorus into these waters.

The Blackland soils are very flat so erosion is not a problem, but development does cause a small increase in sediment load of drainage waters. This increase is particularly apparent during the developmental phase. Turbidity of the drainage water is increased during clearing and land shaping. Once initial development is completed, erosion and turbidity during normal agricultural production is not likely to cause a water quality problem.

There are several water quality parameters which are measurably affected by development, but the change is relatively small. For example, D.O., B.O.D., temperature, and pH, are all slightly higher in drainage water from developed areas. Other parameters which change upon development but are not generally considered critical in evaluation of water quality in this region are Ca, Mg, Cl, Na, and K. There is very little effect of development upon efflux of the metals Cu, Zn, Mn, and Fe.

One potential problem with development of the organic soils for pastures near shell fishing waters is the loss of fecal organisms in drainage waters. The counts of fecal and total coliform bacteria in drainage water from the pastured site were considerably greater than from natural areas. This increase in coliform bacteria from grazed lands is common throughout the U.S. and apparently causes few problems. However, a problem could result if grazed land is located immediately adjacent to shellfish waters. Development also caused an increase in coliform bacteria from the cropped shallow organic soil even though no domestic animals were ever kept on this site.

Comparison of elemental deposition from the atmosphere, as compared to losses in drainage waters from the natural areas, showed that there was 3 to 4 times as much N and P deposited as was lost in drainage waters. The deposition of other elements (Na, Cl, K, Ca, Mg, Cu, Mn, and Zn) was approximately the same as removal in drainage waters. There was a net loss of Fe from the natural areas.

The high organic matter content soils in eastern North Carolina require special sampling techniques to provide reliable estimates of the amount of pesticides applied. The most effective method of confirming the rate of deposition of the herbicide alachlor was the use of filter paper discs laid on the soil surface during application.

Alachlor residues among individual soil samples taken after application of alachlor were highly variable, but an average of seven or more samples within a plot or analysis of a composite sample from seven sites within a plot appeared to provide a reliable estimate of the residue level.

Residues of alachlor (parent compound) disappeared rapidly after application to the organic soil; however, low levels of "apparent" alachlor persisted from one season to the next in a biologically inactive form. There was no significant accumulation of alachlor residue above the detectable, but very low concentrations, that carried over.

Concentrations of alachlor in drainage water after application suggested that some applicators were careful to avoid spraying the V-ditches draining the fields but that some may have sprayed directly over them, or so close that heavy drift of sprays occurred, causing excessively high concentrations of herbicide in drainage water during the first few days after some application. More diligence and care during application of all pesticides used on many farms in the Tidewater Region of North Carolina, where ecologically sensitive areas exist in close proximity to large agricultural areas, would reduce or even eliminate significant hazards caused by direct spraying of, or drift onto water in drainage canals.

Transport of alachlor and probably other pesticides as well in surface runoff from the high-organic soils of the Tidewater Region of eastern North Carolina and similar areas elsewhere does not appear to pose a significant hazard to aquatic life. However, it appears that some hazard from overspraying of or drift into drainage ditches exists in ecologically sensitive areas which the experimental sites represent. Most likely, more diligence and care during application would greatly reduce such hazards.

The major effects of agricultural development on soil properties involved the surface horizon. Development removed the root mat and decreased the surface elevation. The bulk density of the surface horizon is increased and the porosity decreased. Both hydraulic conductivity and drainable porosity are decreased during the developmental process. The effects of development on all soil properties increased with the depth of the organic layer.

Subsidence of the organic soils is greatest directly after development because of irreversible drying and shrinkage of soil in the root zone. After this initial period, subsidence on the deep organic pasture site was less than 1 mm/year for a three year period.

RECOMMENDATIONS

1. Mineral and shallow organic soils should be identified and given first priority in any plan to develop high organic soils in the Tidewater Region of North Carolina. These soils are more agriculturally productive and have fewer problems with P runoff and subsidence. Although inorganic nitrogen efflux is greater for mineral than for organic soils, other problems associated with their development, both environmentally and agriculturally, are not as severe as with the deep organic soils.
   With few exceptions, agricultural development of deep organic soils has not been successful. Problems with buried wood, low bearing strength of the soil mass, etc., cause development costs to be high and management for row crop production to be extremely difficult. Thus, it is recommended that these soils be given a very low priority for development for both environmental and agricultural management reasons. Any development scheme should start with a good soil map so that both the best soils and the problem soils can be identified and assigned appropriate priorities in the developmental process.
2. Peak runoff could be reduced by improving the subsurface drainage. This could be done on the mineral soils by installing drain tubes to increase the rate of water table drawdown. Lower water tables would increase storage available for infiltrating rainfall and reduce runoff rates. This would not decrease the total amount of runoff from a given storm, but subsurface drainage would occur over a longer period of time and the peak outflow rates would be reduced. Another effect of improved subsurface drainage would be to increase the time available to the farmer for seedbed preparation and planting in the spring. Where pumped drainage outlets are used, better subsurface drainage would make it possible to initiate pumping at a later time in the spring and still meet the farmer's drainage requirements during the planting period. Although improved subsurface drainage would probably increase inorganic nitrogen movement from cultivated fields during the growing season, this effect could be reduced by controlling the out-

lets during the winter and early spring months.

3. It should be recognized that organic soils which are developed for agriculture will lose much more phosphorus to drainage water than mineral soils. It is possible that some of the phosphorus lost from the organic soils can be removed from the drainage waters by sediments in ditches or by inorganic materials in the ditchbank. The greater the distance between the field and the outlet, the greater the potential for this reduction to occur. This factor should be considered in planning agricultural development of organic soils.
4. Fecal organisms in drainage waters from grazed organic soils constitutes a potential problem which should be examined more thoroughly. Pastured lands in the study area are far removed from shellfish areas and will probably not cause a problem. However, the potential for problems would be higher for pastures developed on organic soils immediately adjacent to shellfish waters.
5. Educational programs should be directed to farm managers and pesticide applicators operating in the Tidewater Region to call attention to the probable illegality of direct spraying of water in drainage ditches and canals with pesticides used in weed and insect management in row crops. The hazard of such practices to aquatic animals should be stressed. Use of ground equipment for application of pesticides in fields interspersed with drainage ditches could reduce contamination of water by spray drift and overspraying. Pesticide drift and how to reduce it should be an integral part of the educational effort. The education could be a part of continuing educational programs for recertifying and relicensing pesticide applicators.

ACKNOWLEDGEMENTS

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Installation of the field equipment, data collection and the day-to-day operation of the project involved many long days under difficult working conditions. This work was primarily done by Messrs. Toney Jacobs and Frank Massey. Laboratory analyses for water quality parameters were conducted by Mrs. Bertha Crabtree. It would have been impossible to complete this research without the willing and able assistance of these individuals and their personal commitment to the project's success is gratefully acknowledged.

Several others made significant contributions to the study. Mr. Kevin Powell and Mrs. Helen Harris were responsible for collection and analyses of pesticides data. Computer methods to store and manipulate the water quality and hydrologic data were developed and implemented by Dr. Y. K. Tang, Mr. Henry Chen and Mrs. A. Phillip. Ms. Pitsamai Purisinsit conducted hydrologic analyses to correct runoff data for periods of weir submergence. Contributions of all these persons are acknowledged.

Thanks are also due to Mrs. Thelma Utley, Mrs. Joyce Bruffey and Mrs. Joyce Fields for typing the final report as well as the many other reports and papers required on this project.

EFFECTS OF LARGE SCALE AGRICULTURAL LAND DEVELOPMENT ON WATER RESOURCES

INTRODUCTION

Land in the Tidewater Region of North Carolina is flat with surface elevations of only a few meters above sea level. The water table is close to surface and, under natural conditions, large areas of the region are swampy (Heath, 1975). Many of the soils are organic or have high organic surface layers. These soils, which are referred to cumulatively as the Blacklands, present several specific and unique agricultural problems. Drainage is essential for agricultural production in the region and was first initiated in the late 1600's. A large scale drainage project on organic soils occurred in the 1790's (Ruffin, 1861). Since that time there have been periods of clearing and development followed by longer periods of inactivity (Lilly, 1980).

The latest period of increased drainage activity began in the early 1970's when several large corporations became involved in clearing and developing thousands of hectares of land in eastern North Carolina. First Colony Farms in Washington, Tyrrell, Dare and Hyde Counties was the largest of these operations with total holdings of 150,000 hectares and plans in 1973, to clear over 40 thousand hectares by 1981. Three other large operations (Mattamuskeet Farms in Hyde County, Open Grounds Farms in Carteret County and Shima American Corp. in Washington County) planned to develop a total of nearly 40 thousand additional hectares in the Tidewater Region. This planned developmental activity coincided with the large algae bloom problems in the Chowan River and the general awareness that development of any type results in some environmental changes. Consequently, it is natural and appropriate that questions were raised by the scientific community (Science 139:271-275, 1975), by various state and federal agencies and by the general public about the effect that massive land changes would have upon the environment.

There were many specific concerns about the effects of land clearing and development. One was the effect of land development on the rate and time distribution of runoff with some apprehensions that peak rates would be greatly increased surpassing the capacity of existing outlet canals and rivers. The land under development lies between the Albemarle and Pamlico estuaries which are important for both commercial and sport fisheries. State agencies were concerned that these estuaries might be damaged through increased sedimentation from the developing lands, increased nutrient flux into the estuary causing algal blooms, a change in organic matter entry into estuary, pesticide movement into the water, increased input of fecal organisms from pasture lands, increased heavy-metal concentrations, and a change in the fresh water distribution resulting in detrimental effects on salt water organisms because of decreased salinity. Other individuals expressed the concern that clearing and drainage would cause a large increase in oxidation of the organic matter in the soils resulting in a general lowering of land level. Another concern of some was that the increased ditching for drainage would generally lower the water table and significantly reduce recharge to ground water aquifers.

In attempting to address the potential problems and assess the environmental impact of the planned activities, it was recognized that there was a void in basic scientific information concerning the effects of clearing and developing on the hydrology and quality of the drainage waters from organic and high organic mineral soils. This report presents the results of a research project initiated in 1975 to determine the effects of drainage and land development on the hydrology and water quality of drainage waters leaving the area.

OBJECTIVES

1. To analyze drainage waters from three paired sites on First Colony Farms to determine the effects of land development on hydrology and water quality parameters, the seasonal variation of these effects, and the total nutrient and sediment load leaving the areas.
2. To analyze drainage water for selected herbicides and insecticides used in the production of corn and soybeans and to determine the potential for polluting estuarine ecosystems from the pesticides used on the organic and high organic mineral soils in the Blacklands.
3. To determine the effects of land development on water table elevations, seepage to underlying aquifers and soil subsidence and the variation of these effects over time.
4. To evaluate existing hydrologic and nutrient transport models for Blackland conditions, to use these models to extrapolate measured effects of land development for standard events, such as a 25 year

storm, and to predict the effects of land development for ungauged watersheds.

Procedures and results of the study pertaining to objectives 1, 2 and 3 are discussed in this report. Objective 4 is the subject of Ph.D. thesis research by Ms. Pitsamai Purisinsit. The thesis will be filed as an addendum to this report when it is completed in the fall of 1980.

PROCEDURES

Site Selection

The land currently under development in eastern North Carolina is generally flat with surface slopes of less than 0.02 percent. The surface elevation ranges from approximately 0.5 to 5 m above mean sea level, and the water table is frequently within 30 to 60 cm of the surface.

The best approach for determining the influence of land development upon water flow and quality characteristics is to compare drainage water quantity and quality from relatively large areas of similar soil types in developed and undeveloped areas. However, it is extremely difficult to define the drainage area accurately, particularly for undeveloped lands, in most of the low-lying areas of the Tidewater Region. Furthermore, it is difficult to measure the flow rate and water quality parameters in such large flat areas where even minor modifications in the outlet channel to facilitate measurement may cause changes in flow direction and effectively reduce the drainage area. After initial attempts to identify such large areas, it was concluded that a more realistic approach would be to study relatively small areas of developed and undeveloped land where the drainage area could be defined adequately and where outflow rates and water quality parameters could be measured accurately.

Three paired areas (six sites) of developed and undeveloped land on the property of First Colony Farms were selected for the study. Locations of the six sites are shown on a general map of the area in Figure 1. These study areas were chosen to represent the three edaphic groups in the region which largely influence development and management. Although modern soil survey recognizes approximately 40 different soils in the region, the three sites chosen generally span the full range of the region's potentially developable soils. The three major edaphic groups and the experimental sites representing those groups are:

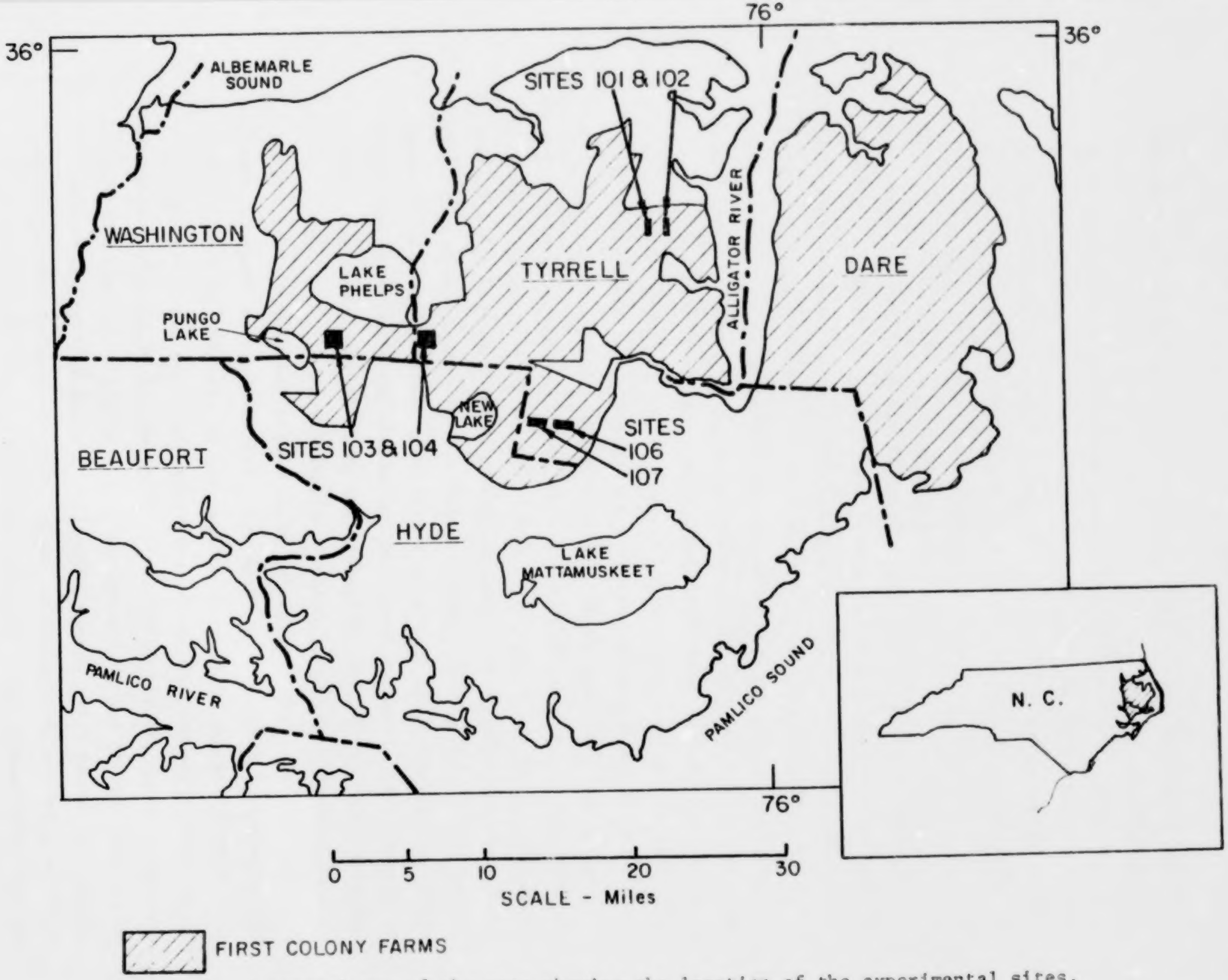

36°
76°
36°
ALBEMARLE SOUND
SITES 101 & 102
WASHINGTON
LAKE PHELPS
TYRRELL
ALLIGATOR RIVER
DARE
PUNGO LAKE
NEW LAKE
SITES
106
107
SITES 103 & 104
BEAUFORT
HYDE
LAKE MATTAMUSKEET
PAMLICO RIVER
PAMLICO SOUND
76°
N. C.
0
5
10
20
30
SCALE - Miles
FIRST COLONY FARMS

Figure 1. A general map of the area showing the location of the experimental sites.

1. Mineral soils with a histic epipedon (Histic Humaquepts) - this group of soils is characterized by a surface horizon with a high organic matter content which does not extend deep enough in the soil profile (< 40 cm) for the soils to be classified as organic soils. The mineral contact below the organic horizon may be either sand or clay. In the region being discussed, this type of soil is the easiest to prepare for cultivated land and is the most productive after clearing.

The paired sites for this soil group were located in Tyrrell County about six miles west of the Alligator River. The land elevation is about 1.8 m above sea level and the soil has about 35 cm of organic matter over a clay loam subsoil. The developed site is identified as site 101 and the undeveloped site as 102 in Figure 1. Site 102 had a stand of harvestable timber during the study. The drainage area for both sites was approximately 7.4 ha drained by a single field ditch.

2. Shallow organic soils (Terric Medisaprist) - these are soils which have a high organic matter surface which extends to depths of 40 to 130 cm below the surface before contacting a mineral layer. This is the second most productive group of soils in the region. The percentage of the soils of this type that are cleared for agricultural purposes depends largely upon the amount of buried wood within the profile.

Sites 106 and 107 (Figure 1) represent, respectively, the developed and undeveloped sites for this soil. The land elevation (0.9 to 1.5 m) is marginal for gravity flow drainage on the sites and flow measurements in a major collection ditch was not possible. The drainage area for each site was also the 7.4 ha drained by a single field ditch. The soils had about 60 cm of organic matter over a sandy loam subsoil. The amount of buried wood was relatively small.

3. Deep colloidal organic (Typic Medisaprist) - this group of soils is characterized by having colloidal organic matter horizons which extend deep (> 130 cm) into the soil profile. These are the least productive of the soils that may be cleared for agricultural production. They usually contain large amounts of buried wood which is a problem both in the initial land preparation and during cultural operations for several years after clearing. Cleared land of this type is most likely to be used for pasture and forage production.

Sites 103 and 104 (Figure 1) represent the developed and undeveloped sites, respectively, for this soil. The developed site (103) was planted to fescue and was under grazing management during the study. The undeveloped site (104) had a cover of small pond pines and small native shrubs which have been almost completely unaffected by man's activities. Each site had a well-defined drainage area of 130 ha which was the area draining into a collector ditch. The collector ditches were about 1600 m (one-mile) long and spaced 800 m (0.5 mile) apart. The developed site (103) had field ditches spaced 100 m apart that emptied into the collector canal; there were no field ditches in the undeveloped site.

A summary of the characteristics of the research sites, including the crops grown in the different years, is given in Table 1. Detailed soil profile descriptions were made, to a depth of about 12 m, for each site and are given in Appendix A.

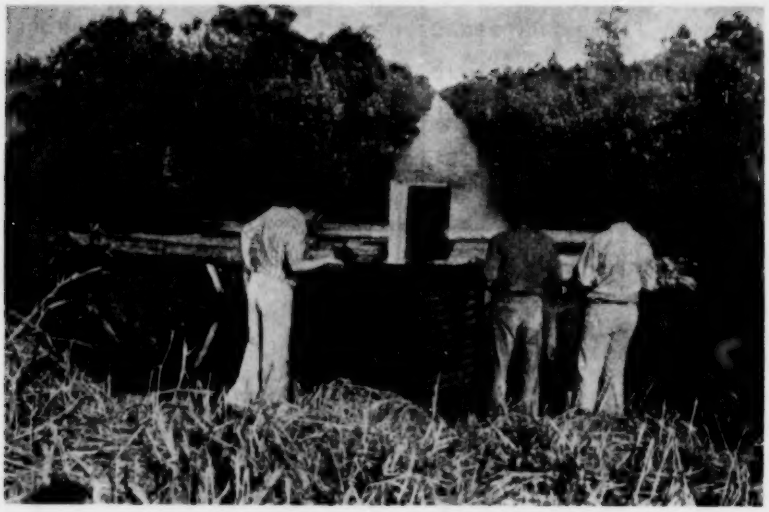
Hydrologic Measurements

Flash-board riser structures with weirs were installed at the drainage outlets at each of the six experimental sites (Figure 2). Schematics of the experimental sites showing the drainage patterns and the placement of instruments and equipment are given in Figure 3. The triangular weirs were calibrated in place and outflow rates were continuously measured by recording the stage on the upstream side of the weirs with type F water level recorders. The weirs were submerged during some periods of high rainfall when the water backed up in the outlet drainage canals. This was caused by inadequate capacity of the outlets and occurred at some sites more than others. Methods for correcting the flow volumes for the period of submergence will be discussed in a subsequent section. The outflow was sampled continuously at each outlet by a semi-proportional automatic water sampler. The stage recorders were serviced weekly, and water samples were collected at the same time for laboratory analyses.

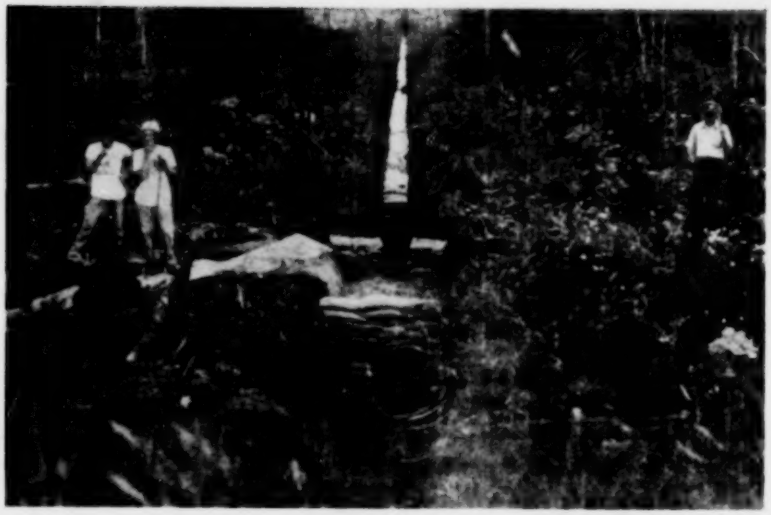
A recording rain gauge was located on each paired site to measure the amount and temporal distribution of rainfall events. A class A evaporation pan was installed near site 103 and instrumented to continuously record pan evaporation during 1976 and 1977. Similar pans were installed on site 103 and at the U.S. Forest Service fire tower about 4 km from site 106 during the summer of 1979. Solar radiation, wind speed, daily maximum and minimum temperatures and relative humidity data were available for the period June, 1977 through 1979 from an experimental peat harvest-

Table 1. A summary of the experimental sites, soils and cropping sequences.

Site No.	Soil	Drainage Area Monitored ha	Crop Grown			
			1976	1977	1978	1979
101	Mineral-histic epipedon	7.4	Natural	Soybeans	Soybeans	Corn
102	Mineral-histic epipedon	7.4	Natural	Natural	Natural	Natural
103	Organic - deep colloidal muck	130	Fescue Pasture	Fescue Pasture	Fescue Pasture	Fescue Pasture
104	Organic - deep colloidal muck	130	Natural (bush, bayberry, gallberry, pond pine)	Natural	Natural	Natural
106	Shallow organic - 50 to 70 cm deep over clay loam	7.4	Corn	Soybeans	Soybeans	Soybeans
107	Shallow organic - 50 to 70 cm deep over clay loam	7.4	Natural	Natural	Natural	Natural



Deep Organic
Site (104)



Mineral
Site (102)

Figure 2. Installation of flash-board riser structures and equipment at the deep organic soil site and at the inorganic soil site for the continuous measurement of outflows and water sample collection. Notice difference between native vegetation as a result of soil differences.

ing site about 4 km from site 103. These data were used to estimate daily potential evapotranspiration.

Water table evaluations were continuously recorded on each site by installing 10-cm diameter observation wells and type F water level recorders. Site 104 did not have field ditches and a single water level recorder was placed near the center of the 130 ha area (Figure 3). All other sites had field ditches spaced either 90 or 100 m apart and at least two recorders were placed in each site. Water level recorders were placed 7.5 m from the field ditch draining the area and at 45 or 50 m from the drain, which was midway between adjacent ditches (Figure 3). The recorders were located beyond the zone of influence of the deeper collector canal at the end of each site. An additional recorder was placed midway between field ditches and 30 m from the collector canal in site 103 (Figure 3). The purpose of this recorder was to determine the effect of the deeper collector canal on water table drawdown near the end of the site and for use in determining the hydraulic conductivity of the profile. Additional water level recorders were installed during 1979 to better define the variation of water table within the field. Piezometers (5-cm diameter) were installed on all sites except 101 at depths of 3.0, 6.1, 9.1, and 12.2 m to determine vertical gradients controlling water movement to (or from) underlying aquifers. Water levels in the piezometers were manually determined at unequal time increments during the study.

Water Quality Measurements

Sampling

A flow-proportional[*] automatic composite water sampler was located at each site for collection of water samples. These composite samples were collected weekly for laboratory analyses. In a previous project, we had determined that chemical changes in the field collector over a two-week period were insignificant, so no preservative was used in the collection bottle. When the samples reached the laboratory, they were maintained at 4°C until analyses were completed. These weekly composite samples were analyzed for total P, total N, nitrate-nitrogen, ammonium-nitrogen, total organic C, and Cl. The composite samples collected the first week of each month were analyzed for Ca,Mg,N,K,Fe,Mn,Zn,Cu, and Cd.

Field measurements of conductivity, salinity, dissolved oxygen, temperature, and pH were made on grab samples taken from water flowing

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[*] Actually was only semi-proportional.

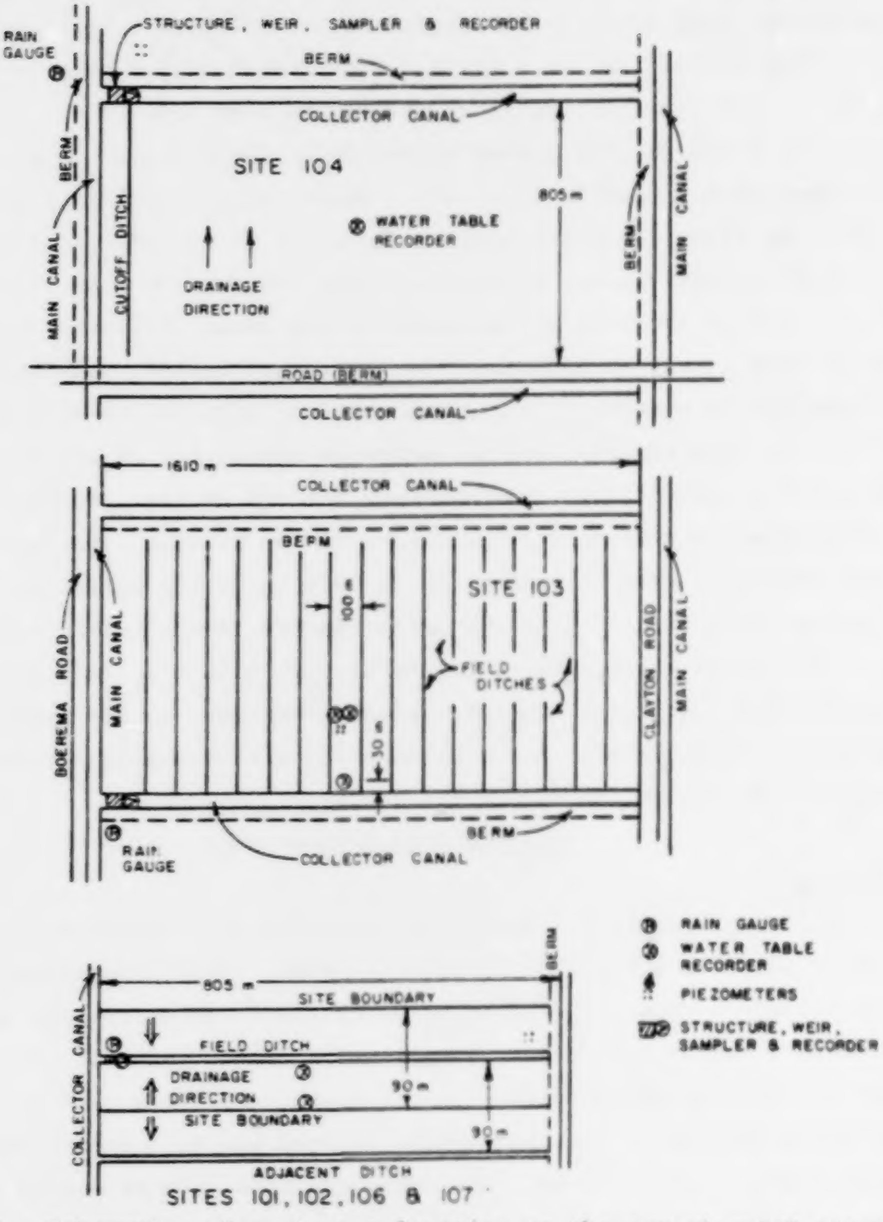
RAIN GAUGE
STRUCTURE, WEIR, SAMPLER & RECORDER
BERM
COLLECTOR CANAL
SITE 104
805 m
WATER TABLE RECORDER
BERM
MAIN CANAL
CUTOFF DITCH
DRAINAGE DIRECTION
BERM
MAIN CANAL
ROAD (BERM)
COLLECTOR CANAL
1610 m
COLLECTOR CANAL
BERM
SITE 103
100 m
FIELD DITCHES
BOEREMA ROAD
MAIN CANAL
30 m
CLAYTON ROAD
MAIN CANAL
RAIN GAUGE
COLLECTOR CANAL
BERM
RAIN GAUGE
WATER TABLE RECORDER
PIEZOMETERS
STRUCTURE, WEIR, SAMPLER & RECORDER
BERM
805 m
SITE BOUNDARY
COLLECTOR CANAL
FIELD DITCH
DRAINAGE DIRECTION
90 m
SITE BOUNDARY
90 m
ADJACENT DITCH
SITES 101, 102, 106 & 107

Figure 3. Schematics of equipment location on the experimental sites.

through the weir at the weekly sampling times. Filterable solids and turbidity were also run on the weekly grab samples. Fecal and coliform bacteria were run on grab samples taken bi-weekly.

Analytical Methods

Temperature, conductivity and salinity were measured with a Model 33 portable S-C-T meter manufactured by Yellow Springs Instrument Company. Initially pH was measured in the field with a portable pH meter and the grab sample was also analyzed in the laboratory. No differences were noted between the two measurement techniques during the first few months, so all subsequent pH measurements were made on grab samples brought to the laboratory. Dissolved oxygen was determined in the field during the "Azide modification of iodometric method" (Standard Methods, 1965, pg. 406).

Turbidity was determined using a candle turbidimeter (Standard Methods, 1965) until 6-14-77; subsequently, all turbidity analyses were done on a Model DRT 100 HG Instruments Turbidity Instrument. Suspended solids (sediment) were determined using the Millipore Suspended Solids Analysis System (> .45 um diameter).

Total and fecal coliforms were run using the membrane filter technique (Standard Methods, 1965, pg. 610). Gelman GN-6 filters were used and the medium used contained no agar. Results were reported as colonies per 100 ml of sample. Water samples collected for coliform analysis were immediately placed on ice and the analysis procedures were initiated within 24-hours of sample collection.

Nitrate was determined using the Lowe and Hamilton (1967) bacterial technique for reduction to nitrite and the nitrite was determined by the procedure described in Standard Methods, 1965, pg. 205. An ammonium electrode was used for ammonium determination. Total Kjeldahl N and total P were analyzed by the procedures described on pages 208 and 232, respectively, of Standard Methods, 1965.

The ampule technique of Oceanographic International Instrument Co. was used for the analysis of total organic C. Biological oxygen demand (5-day) was determined by the North Carolina Department of Natural and Economic Resources Water Laboratory using EPA approved procedures.

The analytical technique used for chloride determinations was that described by Gilliam (1971) except that the water samples were mixed with the extraction solution described.

Metallic cations were determined on a 50 ml aliquot which was evaporated to dryness, dissolved in 10 ml of 2.5N HCl and again evaporated to dryness and dissolved in 10 ml of 2.5N HCl and diluted to 50 ml. A flame photometer was used for Na and K and atomic absorption spectroscopy was used for all other metallic cations.

Laboratory techniques were checked using Quality Control Samples obtained from EPA for all parameters possible. These reference samples were also frequently included with routine samples as a blind check to ensure reasonable analytical accuracy and precision.

All nutrient concentrations and effluxes are expressed on an elemental basis.

Field Work

All developed areas sampled were managed by local farmers over whom we had no control. They were generally very cooperative and informed us in advance of any major planned activities. They also provided information as to fertilizer, pesticide and lime rates used. Details of farming activities, planting dates and fertilizer application are given in Table 2.

Because others have noted large losses of both pesticides and fertilizer nutrients in the first runoff events after application of these chemicals, we had an intensive sampling program for the cultivated fields for the first one or two runoff events after planting and fertilization. Rainfall events immediately following spring fertilization and planting during our investigation tended to be small and widely scattered. This resulted in a smaller loss of nutrients, pesticides, and sediment than would have occurred for more frequent and intensive rainfall. It also increased the cost of the data collection phase of the project as a technician had to stay in the area for several weeks in some cases, until rainfall occurred.

Rainfall Collection

Rainfall and other atmospheric deposition were collected at four of the six experimental sites. The collector was constructed using a 23 cm length of nominal 10 cm diameter PVC pipe. The top edge of the pipe was ground to a sharp edge with the bevel to the outside. The internal diameter was 10.48 cm. The bottom of the pipe was sealed with a standard PVC end cap which was solvent welded to the pipe. A 1.25 cm hole was drilled in the center of the end cap and a 15 cm piece of 1.25 cm (O.D.) PVC pipe was welded into this hole. The PVC collector was placed on top

Table 2. A detailed summary of the crops planted and fertilizer and lime applied to each site.

Site		Year	Crop	Planted	Fertilizer		Lime	
No.	Soil				Date	Rate (N-P-K) (kg/ha)	Date	Rate (T/ha)
102	Mineral-histic epipedion	1975-79	Good stand of pine, no chemicals added					
101	Mineral-histic epipedion	1976	Natural, clearing began in 6-77					
101		1977	Soybeans	7-19	7-1	36-48-89 5.6 Cu	7-1	13.4
101		1978	Soybeans	6-28, 6-29	6-28	24-31-117 5.6 Cu		
101		1979	Corn	5-7, 5-8	5-7 6-26	34-45-167 Cu,Mn,Zn(3.5) 190-0-0	5-7	4.5
104	Typic Medisaprist > 130 cm of organic matter	1975-79	Native vegetation of gallberry and poor quality pine. No chemicals added.					
103	Typic Medisaprist > 130 cm of organic matter	1974	cuts 1-8 millet cuts 9-16 sudan, sorghum	spring		56-25-46		13.4
		1974	rye grass	fall		56-25-46		
		1975	cuts 1-8 Lespedeza & Dallas grass	spring		56-25-46		
		1975	cuts 9-16 wheat fescue, clover	fall		56-25-46		
		1976	cuts 7-8 Dallas grass	spring		56-0-0		13.4
		1976	cuts 9-10 fescue, clover	spring		56-0-0		6.7
		1976	cuts 1-8	summer		56-0-0		
		1978			5-8	67.2-24.5-46		
		1979	cuts 1-8					
107	Terric Medisaprist 70-130 cm of organic matter	1975-79	Native vegetation of pine and gallberr					
106	Terric Medisaprist 70-130 cm of organic matter	1976	Corn			170-56-56*		
106	Terric Medisaprist 70-130 cm of organic matter	1977	Soybeans	6-21	6-21	0-25-46	6-21	6.72
106	Terric Medisaprist 70-130 cm of organic matter	1978	Soybeans	7-1 & 7-3		17.9-15.7-3.3 B-.6, Cu 1.12		
106		1979	Soybeans	6-3	5-21	17.9-15.7-33.1		

*estimate

of a 15 x 20 x 25 cm box open on one side and with a 1.25 cm hole in the top. The 1.25 cm pipe from the collector passed through the hole in top of the box and protruded into a 0.5 L polyethylene bottle with hole in the top just large enough to accomodate the 1.25 cm pipe from PVC collector. The box was placed on a stand 30 cm from the soil surface. Samples were removed from the collector weekly when rainfall occurred. This system was placed next to the recording rain gauge at each site which was used for measuring the quantity of rainfall.

Rainfall samples were transported to the laboratory and were analyzed for pH, NO_3-N, NH_4-N, TKN, P, Ca, Mg, Na, K, Cu, Fe, Mn, Zn, Cd, and Cl. The procedures used for these analyses were the same as those used for analysis of runoff water samples.

Application, Pesticide Sampling, and Analysis

General

The project was designed to study those pesticides used by the cooperating farm for weed and insect control. Initially, we envisioned that the growers would use as many as three herbicides in the production of soybeans, corn, and forage grass. In the course of the 3-year study, normal cropping sequences in both developed areas used for row crops (Sites 101 and 106) would consist of alternate crops of corn and soybeans (i.e., corn one year and soybeans the next). Soybeans were planted on both sites in 1977. As a result of unfavorable weather during the corn-planting season in 1978 and 1979, soybeans were planted in Site 106 both years and in 101 in 1978. Corn was planted in Site 101 in 1979. Under normal conditions, corn would have been planted in at least 1 of the 3 years at both sites.

Due to these unforeseen circumstances, pesticide use was restricted almost entirely to alachlor [2-chloro-2',6'-diethyl-N-(methoxymethyl) acetanilide]. Thus, we investigated intensively the distribution of alachlor in the organic soils and in the drainage water from the developed Sites 101 and 106.

Application of pesticides other than alachlor on Sites 101 and 106 by the farm operators was sporatic and unpredictable. Generally, we could not prepare for such applications in advance; hence it was difficult to attempt to study movement of pesticides other than alachlor. We did anticipate application of terbufos [O,O-diethyl-S-(((1,1-dimethylethyl) thio)methyl)phosphorodithioic acid] to corn on Site 101 in 1979 by a few weeks, and some attention was directed to study of this pesticide.

In 1978, 2,4-D [2,4-dichlorophenoxy)acetic acid] was applied to the third developed site (Site 103) on August 14, 1978 for the purpose of obtaining data on herbicide transport in surface runoff from pastures. This herbicide is often used in such areas to control broadleaf weeds and woody species. In recent years interest in the movement of the phenoxy herbicides in the environment has expanded as dioxin contaminants in formulations of 2,4,5-T has been confirmed and their presence in 2,4-D formulations alleged by those unfamiliar with this herbicide.

Land preparation in these recently cleared and drained lands is far less uniform than on land that has been in production for long periods.

Secondary objectives were to confirm the amount of alachlor applied, to determine the uniformity of application, and to estimate the variation in the alachlor level among soil samples obtained from the large fields.

Land Preparation and Pesticide Application

The soils are described in detail elsewhere in the report. In preparation for planting soybeans and corn, fertilizer was applied on Sites 101 and 106 and the fields disked and dragged. The planting date for soybeans varied from early June to mid July. The pesticides applied, the dates, rates, and methods of application, and related information for Sites 101 and 106 are shown in Table 3. Alachlor was applied by ground equipment to Sites 101 and 106 in 1977 and to Site 106 in 1979. The herbicide was applied by air to Sites 101 and 106 in 1978 and to Site 101 in 1979. The rate of application of alachlor as reported by the farm manager was 4.48 kg/ha in all cases.

The developed pasture included as a study area, Site 103, was aerially sprayed with 2,4-D as the alkanolamine salt at a rate of 1.12 kg/ha on August 14, 1978. The application was delayed for several weeks because frequent rains interfered with scheduling the applications. However, a drought followed application, and no significant runoff occurred at Site 103 for about 5 months. Considerable time was expended in order to be prepared to collect runoff samples, should rain have occurred. However, because of the long absence of rain, we were unable to obtain runoff data for 2,4-D. Rapid degradation of 2,4-D precluded continuing this phase of the study.

Table 3. Planting dates and pesticide applications.[a]

Year		Site 101	Site 106
1977	Crop	Soybeans	Soybeans
	Planting date	July 19	June 21
	Alachlor applied	July 20	June 21
	Equipment used to apply alachlor	Ground	Ground
	Rate of application	4.48 kg/ha (ai)	4.48 kg/ha (ai)
	Type of application	Broadcast, surface	Broadcast, surface
	Volume of solution	190 liters/ha	190 liters/ha
1978	Crop	Soybeans	Soybeans
	Planting date	June 28-29	July 1 and 3
	Alachlor applied	June 29	July 1 (Reps II & IV) July 3 (Reps I & III)
	Equipment used to apply alachlor	Aerial	Aerial
	Rate of application	4.48 kg/ha (ai)	4.48 kg/ha (ai)
	Type of application	Broadcast, surface	Broadcast, surface
	Volume of solution	LV	LV
1979	Crop	Corn	Soybeans
	Planting date	May 7-8	June 3
	Alachlor applied	May 11	June 5
	Equipment used to apply alachlor	Aerial	Ground
	Rate of alachlor	4.48 kg/ha (ai)	4.48 kg/ha (ai)
	Type of application	Broadcast, surface	Broadcast, surface
	Volume of solution	LV	190 liters/ha
	Terbufos (Counter^R) applied	May 7-8	
	Rate of terbufos	1.3 kg/ha (ai)	
	Type of treatment	In furrow	
	Dicamba (Banvel^R)	June 26	
	Rate of application	0.4 kg/ha in 30% nitrogen solution	
	Type of application	Postemergence, broadcast	

[a] Site 103 was sprayed with 2,4-D on August 14, 1978 at a rate of 1.12 kg/ha.

Soil Sampling

In 1977, four plots, each 0.4 ha in size, were established at each of the two 7.4-ha sites (101 and 106). Sites 101 and 106 were each about 90 m wide, with a drainage V-ditch splitting the field and parallel to the long axis of the sites. Two of the samll plots at each site were on one side of the V-ditch and two were on the other side. Soil samples were collected in 1977 from each plot in a line perpendicular to the V-ditch. On successive sampling dates, samples were collected in a line approximately 5 meters farther into the plot, thus avoiding the sampling of the same spot on different dates.

Samples of surface soil were taken for the first 4 weeks after application (28 and 29 days for Sites 101 and 106, respectively). The sampler was patterned after the Smith Surface Soil Sampler[1/] and was fabricated from a 20.4-cm (diam) aluminum desiccator. At both sites seven surface samples were collected from each plot on each sampling date in 1977. At Site 101 surface soil samples were taken to a depth of 5 cm immediately after spraying and at 1 and 5 days after spraying. Fourteen and twenty-eight days after treatment, surface samples were taken to a depth of 7.5 cm. Surface soil at Site 106 was sampled to depth of 5 cm immediately after herbicide application and at 1 and 7 days after application. Twenty-nine days after spraying, surface samples were taken to a depth of 7.5 cm. The seven individual samples taken from each plot during the first 4 weeks after application in 1977 were analyzed separately to obtain an estimate of the variation in spray distribution over the fields.

Subsurface soil samples were taken with a split-tube sampler (2 cm diameter) to a depth of 30 cm. Fifteen soil cores were collected randomly from each plot and divided into depth increments. The samples were composited by depth increments to give one sample for each depth range from each plot. These subsurface samples were collected 14, 28, 56, and 248 days after treatment at Site 101, and 29, 56, and 307 days after treatment at Site 106. All soil samples (surface and subsurface) were placed in polyethylene bags and frozen until analyzed. Insulated

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[1/] C. N. Smith. 1975. U.S. Environmental Protection Agency, Athens, Ga. Unpublished report.

boxes with solid carbon dioxide were used during collection and transport of the samples to the laboratory. Check samples were collected from untreated sites.

Soil samples were collected again in 1978 and 1979. Sampling times varied in different years and experimental sites due to weather conditions, wet soil, and difficulties in scheduling sampling. Sampling methods were identical to those reported for 1977 except that the individual samples for each plot, taken with the Smith Surface Soil Sampler or with the split-tube sampler, were composited by plots so that a single composite soil sample was analyzed for each plot at each site and date.

In 1979, 15 discs of Whatman number 1 filter paper (12.5 cm diameter) were placed in each 0.4-ha plot immediately before application of alachlor. The paper discs were recovered immediately after application, placed in small glass jars, refrigerated, and transported to the laboratory for analysis.

Water Sampling

Runoff samples were collected during and after two rainfall events at both sites in 1977. In 1978 and 1979, runoff samples were taken during and after four or five rainfall events at each site. Times of sampling and flow conditions through the weirs are recorded in the tables.

Alachlor residues were separated from drainage water samples in the field by the use of XAD-2[2/] macroreticular resin in order to facilitate storage and transfer to the laboratory (Schnare et al. 1979). One-liter grab samples taken from the weirs and occasional composite samples from the automatic samplers were each passed through tubes containing 3 to 5 g of resin. The tubes were placed in polyethylene bags and kept on ice until arrival at the laboratory, where they were stored at -18 to -20 C until analysis.

Soil Analysis for Alachlor in 1977

The methods of analysis employed in this study were extentions of previous work conducted by Hunt (1979).

[2/] Amberlite XAD-2, a nonionic polymeric adsorbent, Mallinckrodt, Inc.

In the laboratory, soil samples were thawed, air-dried, thoroughly mixed, and passed through a 4.75-mm sieve. In 1977 the analytical method consisted of shaking 25 g of soil four times for 15 min with n-hexane on a mechanical shaker. The extracts were then combined and concentrated in a rotary-vacuum evaporator. The concentrated extracts were analyzed by gas chromatography on a Micro-Tek 220 instrument equipped with an electron-capture (^{63}Ni) detector. The step-wise procedure used for determining alachlor in the organic soils was as follows:

Extraction:

1. Place 25 g of soil in a 475-ml glass jar. Add 100 ml of n-hexane to the sample in the jar and secure the lid. (A polyethylene liner was placed under the lid).
2. With mechanical shaker, extract for 15 min.
3. Allow a few minutes for settling; then decant the n-hexane into a 1-liter evaporating flask, filtering through anhydrous sodium sulfate.
4. Repeat the extraction with three 50-ml portions n-hexane, adding the n-hexane extracts to the evaporating flask.
5. Using a rotary evaporator, evaporate solvent to dryness.
6. Dissolve and adjust the volume with n-hexane for gas chromatographic analysis. When soil is very wet, ethyl acetate should be substituted for n-hexane in the extraction procedure.

Cleanup:

Cleanup of n-hexane extracts was unnecessary. Cleanup of ethyl acetate extracts was accomplished on a Florisil column as follows:

1. Evaporate the ethyl acetate extract to dryness on a rotary flash evaporator.
2. Dissolve the residues in 10 ml of n-hexane.
3. Prepare a 2 by 20-cm column as follows:
    - (a) Reduce activity of Florisil by addition of water (2% w/w) to Florisil activated for 24 hr at 140 C.
    - (b) Plug the column with glass wool.
    - (c) Add 2 cm of anhydrous sodium sulfate to column.
    - (d) Add 5 cm of deactivated Florisil to column.
    - (e) Add 2 cm of anhydrous sodium sulfate to column.
    - (f) Wet column with n-hexane
4. Add the 10 ml of n-hexane extract onto the column.

5. Wash the flask twice with 10 ml of hexane, and add each wash to column.
6. Add 100 ml of 6% diethyl ether-petroleum ether (addition of 100 ml of 15% diethyl ether-petroleum ether is sometimes necessary)
7. Discard the washes.
8. Add 100 ml of 9:1 petroleum ether:acetone to the column and save the eluate.
9. Reduce the eluate volume to 10 ml on water bath for gas chromatography.

Detection:

1. Instrument: Micro-Tek 220 gas chromatograph
2. Detector: Electron capture (^{63}Ni)
3. Column: 183 by 0.64-cm glass; 4% SE-30 + 6% QF-1 on Gas Chrom Q (60/80 mesh)
4. Operating parameters:

Injection port temperature	205 C
Column temperature	195 C
Detector temperature	265 C
Nitrogen flow rate	100 ml/min
Nitrogen purge	15 ml/min
Attenuation	10^2 x 32
Chart speed	1.3 cm/min
Retention time	@ 4 min

Soil Analysis for Alachlor in 1978 and 1979

In 1978 and 1979 the analytical method was modified to improve the extraction efficiency. Extraction studies showed that ethyl acetate was more efficient than n-hexane for extracting alachlor from the organic soil. The recovery was further improved by Soxhlet extraction. Therefore, the extraction procedure was changed to an ethyl acetate Soxhlet extraction, using 25 g of soil. The ethyl acetate extracts were concentrated on a rotary evaporator. Low residue samples required cleanup on a Florisil column. The extracts were analyzed by gas chromatography using a Micro-Tek 220 instrument equipped with an electron-capture (^{63}Ni) detector. The step-wise procedure for determining alachlor in the organic soils was as follows:

Extraction:

1. Weigh 25 g of soil into a Soxhlet thimble (33 mm id by 80 mm length); place a piece of glass wool on the top of the soil.
2. Add 200 ml of ethyl acetate and 5 or 6 boiling chips to a 500-ml flat bottom flask.
3. Place the extraction thimble in a Soxhlet extractor and attach the extractor to the flask.
4. Bring the ethyl acetate to a boil and let the extraction continue for 5 hr.
5. Allow the extract to cool; then rinse the thimble with 25 ml of ethyl acetate.

Cleanup:

Samples with high residues did not require cleanup on a column. These samples were concentrated, using a rotary evaporator (40 C), to approximately 2 ml and were then transferred to concentration tubes using _n_-hexane. The extract and _n_-hexane rinses were passed through a small pad of sodium sulfate as they were being transferred to the concentration tubes.

Low residue samples were processed as follows:

1. Evaporate each sample just to dryness. Care should be taken not to go beyond dryness; otherwise, the samples will not redissolve in _n_-hexane (step 2 immediately below).
2. Redissolve residue in 50 ml of _n_-hexane.
3. Prepare a 2 by 200-cm column as follows:
    (a) Reduce activity of Florisil by addition of water (2% w/w) to Florisil activated for 24 hr at 140 C.
    (b) Plug column with glass wool.
    (c) Add 2 cm of anhydrous sodium sulfate to the column.
    (d) Add 5 cm of deactivated Florisil to column.
    (e) Add 2 cm of anhydrous sodium sulfate to column.
    (f) Place a glass wool plug at the top of the column.
    (g) Wet the column using 50 ml of _n_-hexane.
4. Add the 50 ml of _n_-hexane extract onto the column.
5. Discard the _n_-hexane eluate.
6. After the _n_-hexane eluant has entered the column, add 150 ml of 6% anhydrous ethyl ether in petroleum ether. Discard this eluate.

7. Add 150 ml of 15% anhydrous ethyl ether in petroleum ether and save the eluate.
8. Concentrate the ethyl ether:petroleum ether (15:85) eluate on a rotary evaporator (40 C) to 2 to 3 ml, and transfer it to concentration tubes using n-hexane.
9. Adjust the volume for gas chromatography.

Detection:

1. Instrument: Micro-Tek 220 gas chromatograph
2. Detector: Electron capture (^{63}Ni)
3. Column: 122 by 0.64-cm glass; 4% SE-30 + 6% QF-1 on Gas Chrom Q (60/80 mesh)
4. Operating parameters:

Injection port temperature	210 C
Column temperature	180 C
Detector temperature	300 C
Nitrogen flow rate	100 ml/min
Nitrogen purge	15 ml/min
Attenuation	$10^2 \times 8$, $10^2 \times 16$
Chart speed	1 cm/min

Water Analysis for Alachlor

Tubes of XAD-2 resin containing alachlor residues were thawed, and the resin in each tube was transferred to a glass chromatographic column. Alachlor was eluted from the resin with ethyl acetate. The eluate was evaporated just to dryness on a rotary-vacuum evaporator, and the residue was dissolved in n-hexane. Analysis was performed on the n-hexane solution with the same instrument used for the soil analyses.

Cleanup of XAD-2 Resin:

1. Fill a Soxhlet thimble (33 mm id by 80 mm length) with XAD-2 resin (Amberlite nonionic polymeric adsorbent), and place a piece of glass wool on top.
2. Add 250 ml of methanol and 5 to 6 boiling chips to a 500-ml flat bottom flask.
3. Place the thimble in a Soxhlet extractor and attach to the flask.
4. Bring the methanol to a boil, and let the extraction continue for 8 hr.

5. Allow the methanol to cool and discard it, and replace it with 250 ml of acetonitrile; extract for 8 hr.
6. Drain the excess acetonitrile from thimble and pour the XAD-2 resin in a beaker.
7. Add 250 ml of diethyl ether to beaker and stir for 1 hr (with a magnetic stirrer).
8. Repeat Step 7 two more times.
9. Drain the diethyl ether from resin.
10. Rinse the XAD-2 resin with 250 ml of methanol.
11. Repeat Step 9 until all traces of ethyl ether are removed (usually 4 to 5 rinses).
12. Store XAD-2 resin in methanol.

Preparation of XAD-2 Resin Tubes:

In 1977 and 1978 the procedure for preparing the XAD-2 resin tubes in the field was as follows:

1. Stopper one end of a 10 by 0.5-cm gas drying tube with glass wool. Add a methanol slurry containing 3 to 4 g of XAD-2 resin to the tube. Stopper the other end with glass wool and fit the nipple ends to the tube.
2. Connect the tube containing resin to a sampling jar (a 1-liter glass jar with a drainage port in the center of the bottom) using a 5-cm length of Tygon tubing. To the other end of the tube, attach another piece of tubing and attach a screw-type pinch clamp to this piece of tubing.
3. Pass two 150-ml portions of distilled water through the tube.

In 1979 the XAD-2 resin tubes were prepared in the laboratory as follows:

1. Stopper one end of a 10 by 0.5-cm gas drying tube with glass wool. Add the methanol slurry of XAD-2 resin to a height of 3.5 cm. Place a glass wool plug on top and cap the drying tube.
2. Connect the drying tube to a 500-ml separatory funnel with a 6 to 8-cm length of Tygon tubing. Add 300 ml of distilled water to the separatory funnel, and let it drip through the XAD-2 resin.
3. Seal each end of the drying tube and store it in freezer until ready to use.

Transfer of Alachlor from Water to Resin Tubes in the Field:

1. Connect the tube containing resin to the sampling jar using a 5-cm length of Tygon tubing. To the other end of the tube attach another piece of tubing, and attach a screw-type pinch clamp to this piece of tubing.
2. Add a 1-liter water sample to the sampling jar. Allow the water to pass through the XAD-2 resin. Using the pinch clamp, limit the rate of flow to less than 50 ml/min.
3. Rinse the sampling jar with 150 ml of distilled water, and pass the rinse through the tube.
4. Remove the tube containing resin and pesticide, and place it in a plastic bag; freeze the sample until analysis.

Extraction of Alachlor from XAD-2 Resin:

1. Transfer the resin using distilled water to a glass chromatographic column (1 cm diam id) fitted with a Teflon stopcock and plugged with glass wool. Place a glass wool plug at the top of the resin.
2. Drain the water from the column. A small amount of pressure is needed to remove the last traces of water.
3. Add 10 ml of ethyl acetate to the column. Using a small amount of pressure, allow about 5 ml of ethyl acetate and any remaining water to pass through the resin. Collect eluting water and ethyl acetate in a 125-ml separatory funnel. In 1978 and 1979, the amount of ethyl acetate used in this step was changed to 20 ml.
4. Allow the remaining ethyl acetate to equilibrate in the column for 30 to 45 min.
5. Drain the remaining ethyl acetate into the separatory funnel until it reaches the top of the resin.
6. Add a 10-ml portion of ethyl acetate, drain about 5 ml into the separatory funnel, and allow remainder to equilibrate for 30 to 45 min.
7. Drain the remaining ethyl acetate into the separatory funnel until it reaches the top of the resin.
8. Repeat Steps 6 and 7 above with another 10 ml of ethyl acetate.
9. Shake the separatory funnel containing the combined ethyl acetate extracts and allow layers to separate. Drain aqueous layer into another separatory funnel and reextract with 10 ml of ethyl acetate. Add this ethyl acetate wash to the ethyl acetate extract.

10. Transfer the combined ethyl acetate extract to an evaporation flask, filtering through a pad of sodium sulfate.
11. Concentrate to 3 to 5 ml using a rotary evaporator (40 C) and transfer to concentration tubes using n-hexane.
12. Adjust volume for gas chromatography.

Checks and Recoveries:

1. Add 6 cm of the XAD-2 resin, contained in a methanol slurry, to a glass chromatographic column (1 cm id) fitted with a Teflon stopcock and plugged with glass wool. Place a glass wool plug at the top of the resin.
2. Allow methanol to drain from column.
3. Add 300 ml of distilled water to resin and let it drip through column.
4. The check and recoveries are added to the column in 1 liter of distilled water. (The recoveries are obtained by fortifying dry flasks, letting them air dry, and then redissolving the alachlor in 1 liter volumes of distilled water).
5. When drainage of the 1 liter from the column stops, a little pressure is used to remove any remaining water.
6. Continue as in Steps 3 through 12 under "Extraction of Alachlor from XAD-2 Resin" above.

Detection:

1. Instrument: Micro-Tek 220 gas chromatograph
2. Detector: Electron capture (^{63}Ni)
3. Column: 122 x 0.64-cm glass; 4% SE-30 + 6% QF-1 on Gas Chrom Q (60/80 mesh)
4. Operating parameters:

Injection port temperature	210 C
Column temperature	180 C
Detector temperature	300 C
Nitrogen flow rate	100 ml/min
Nitrogen purge	15 ml/min
Attenuation	10^2 x 8, 10^2 x 16
Chart speed	1 cm/min

Filter Paper Analysis for Alachlor

In the laboratory, the filter papers were thawed and subsampled. Representative subsamples were extracted twice in a Soxhlet extractor containing a 1:1 mixture of methanol:ethyl acetate. The extracts were combined and diluted to volume. Gas chromatographic analysis was performed on the extracts with the same instrument used for the soil analyses. The step-wise procedure for filter papers was as follows:

Extraction:

1. Fifteen filter paper samples were collected from each plot. The filter papers were quartered, and one-fourth taken from each and combined (3.75 filter papers). The combined quarters were placed in a Soxhlet thimble (33 mm id by 8 mm length).
2. Add 250 ml 1:1 methanol:ethyl acetate and some boiling chips to a 500-ml flat-bottom flask.
3. Place the thimble in a Soxhlet extractor, and attach the extractor to the flask.
4. Bring the methanol:ethyl acetate (1:1) to a boil, and let the extraction continue for 2 hr.
5. Allow the extract to cool and remove the flask.
6. Reextract the filter papers for an additional 2 hr using another 250 ml of 1:1 (v/v) methanol:ethyl acetate.
7. Allow the second extract to cool and then combine the two extracts.
8. Dilute the combined extracts to an appropriate volume with 1:1 methanol:ethyl acetate for gas chromatographic determination.

Detection:

1. Instrument: Micro-Tek 220 gas chromatograph
2. Detector: Electron capture (^{63}Ni)
3. Columns: 122 by 0.64-cm glass; 4% SE-30 + 6% OV-210 on Gas Chrom Q (60/80 mesh)
   183 by 0.64-cm glass; 4% SE-30 + 6% OV-210 on Gas Chrom Q (80/100 mesh)

4. Operating parameters:

	122-cm column	183-cm column
Injection port temperature	215 C	205 C
Column temperature	190 C	165 C
Detector temperature	285 C	300 C
Nitrogen flow rate	100 ml/min	100 ml/min
Nitrogen purge	15 ml/min	15 ml/min
Attenuation	1 x 1024	10^2 x 16
Chart speed	1 cm/min	1 cm/min

Analytical Procedure for 2,4-D in Water

Extraction:

1. Place 500 ml of sample water in a 1-liter separatory funnel.
2. Acidify to pH $\leq$ 2.0 (alkacid paper test) using concn H_2SO_4 (about 2 ml).
3. Add 250 ml of ethyl ether to the flask.
4. Stopper the flask and shake the contents for 1 min with frequent venting.
5. Allow layers to separate, and drain aqueous portion into a second separatory flask.
6. Extract with 100 ml of ethyl ether as in Steps 4 and 5.
7. Extract with 100 ml of ethyl ether as in Steps 4 and 5 once more.
8. Combine the ether extracts (a total of three extractions), and pass the combined extract through anhydrous sodium sulfate into 1-liter Kuderna Danish flask fitted with a 15-ml concentration tube.
9. Reduce the volume on water bath.

Esterification:

1. Blow the 2,4-D extract in the concentration tubes to dryness (hot H_2O bath ca 60 C).
2. Add 0.5 ml of BF_3-butanol (14%) reagent to the tube.
3. Rinse the sides of tube with 1-butanol (ca 1 to 2 ml).
4. Place tube on 50 to 60 C water bath under a gentle stream of air for about 10 min.
5. When the volume is 0.5 ml, remove the tube and allow it to cool.
6. Transfer the residue to a 125-ml separatory funnel using 10 ml of *n*-hexane.

7. Add 0.5 ml of water saturated with NaCl and 15 ml of water saturated with $NaHCO_3$ to the funnel.
8. Shake gently with frequent venting for a total of about 1 min.
9. Drain the aqueous layer into a second funnel, and extract the aqueous solution with another 10 ml of *n*-hexane.
10. Combine the *n*-hexane extracts in an evaporating flask; wash the funnels with 5 ml of *n*-hexane and add the washes to the flask.
11. Reduce the volume as necessary for gas chromatography on a rotary evaporator at or below room temperature.

Detection:

1. Instrument: Micro-Tek 220 gas chromatograph
2. Detector: Electron capture (^{63}Ni)
3. Column: 183 by 0.64-cm glass; 4% SE-30 + 6% QF-1 on Gas Chrom Q (60/80 mesh)
4. Operating parameters:

Injection port temperature	205 C
Column temperature	195 C
Detector oven temperature	265 C
Nitrogen flow rate	110 ml/min
Nitrogen purge	15 ml/min
Chart speed	1.3 cm/min

Analysis of Water for Terbufos

A modest amount of time was devoted to adapting a method for determining residues of terbufos in runoff. The approach involved use of the XAD-2 resin and direct injection of the ethyl acetate eluate from the resin columns into an electron-capture gas chromatograph. The terbufos and interferences did not separate, and this effort was discontinued.

Soil Properties

The processes of land clearing and development are usually performed with heavy machinery and the associated scraping, shaping and grading may cause dramatic changes in the soil properties, particularly near the surface. Soil properties may continue to be changed as the soils are limed, tilled and farmed over subsequent years. In order to determine the effects that agricultural land development has on the hydrology of this area, it is necessary to characterize the changes in soil properties that result from such development. A study of the physical properties of the organic soils was conducted by Badr (1978) and is discussed in detail in his M.S. thesis. Properties of the soils in their natural states were determined for each of the paired sites and compared with the results for the respective developed sites. Special attention was given to hydraulic conductivity and water yield relationships, as it is these properties that govern the rate that water drains from soils and the amount that will remain in the profile after drainage.

Undisturbed soil samples were obtained from each site using a core method similar to that described by Blake (1965). Size of the cores was 7.6 cm in diameter and 7.6 cm in length. Prior to sampling, the profiles were examined to identify soil layers on each site, then samples were taken to represent each soil layer. Samples were collected from random locations on each site. All samples and measurements were replicated at least 3 times. The samples were trimmed in the field, placed in waxed cardboard boxes and sealed in plastic bags to prevent drying. They were trimmed again in the lab and saturated before the measurements. For soil water characteristic measurements, a system was set up to use the same soil sample for all pressure steps by initially saturating the sample and measuring the outflow after each increase in pressure. Air pressure was applied at nine steps corresponding to pressure heads of 0, 2, 10, 25, 50, 75, 100, 150, and 200 cm of water. The water content for all pressure steps in the drainage branch was calculated on the wet volume basis as suggested by Boelter (1972). The water content at the 15 bar wilting point was determined on separate samples. These samples were placed on a pressure plate, saturated and then subjected to an air pressure of 15 bars for 48 hours. Then the samples were dried and the water content calculated on a wet volume basis.

Saturated hydraulic conductivity was measured by maintaining a ponded surface of constant depth on the surface of the 7.5 cm cores and measuring the outflow rate after conditions had been maintained for six hours or more. Then the saturated K value was calculated directly from Darcy's law. Bulk density and shrinkage percent were determined by carefully trimming the core samples, drying and measuring the dry volume and weight according to the methods described by Blake (1965) and Holtz (1975).

Organic matter content was measured by estimating the carbon content in the soil samples using the ignition method described by Ball (1964). This method involves igniting the samples in a muffle oven at 375°C for 16 hours. Organic matter content was calculated as the ratio of the difference between the oven dry weight and weight of the residue after ignition. The relationships between drainage volume or water yield and water table depth for each profile were calculated from the soil water characteristics by methods described by Skaggs et al. (1978).

Soil Subsidence

Field elevation surveys were conducted on each site to determine the effect of land drainage and development on subsidence. Surveys were conducted in 1977 and at the end of the project in 1980; additional surveys were conducted on some sites in 1976. The bottom of the flash-board riser structure served as a bench mark for the developed sites. For the mineral and shallow organic sites (101 and 106), elevations were determined at approximately 1 m intervals for transects extending from the middle of the field on one side of the ditch, across the ditch to the middle of the field on the other side. Elevation measurements were made on five transects between adjacent field ditches on the deep organic site 103. This pasture site had a gentle slope from the middle of field to the ditches and measurements were made at 16.7 m intervals across each transect. A bench mark was established on each undeveloped site by driving a galvanized pipe well into the mineral layer. Stakes were placed at 5 to 10 positions on a transect perpendicular to the drainage ditches, and on another transect parallel to the ditch. Surface elevations next to the stakes were determined during each survey.

Soil subsidence normally refers to the lowering of the soil surface elevation due to oxidation of organic matter or the shrinkage of soils due to the loss of water. However, there are additional factors that cause the reduction of surface elevations during clearing and development of these soils. During development the root mat is removed, buried wood is extracted and burned or otherwise discarded, the surface soil is somewhat compacted and earth is moved to shape the fields for surface drainage. Elevation surveys were conducted on fields near sites 101 and 106 to determine the effect of various stages of development on the shape and relative roughness of the surface and on the surface elevation. It was not possible to make "before" and "after" surveys to determine these effects directly. However, surveys were made on fields in the "rough cleared" condition after trees and other vegetation had been pushed into a windrow midway between field ditches; on adjacent fields that had been root-raked and smoothed; and on fields that had been shaped for surface drainage in the "turtle back" fashion with slopes of approximately 0.5% to 1% from the middle of the field toward the field ditches. Crops were planted after the latter stage. Row crops were planted on beds - one row per bed - constructed parallel to the field ditches and about 0.3 to 0.45 m high. All elevations in planted fields were taken at the bottom of the furrow between rows.

Timber from the undeveloped site 102 was harvested in the winter of 1979-80 after field observations in this study were complete. Elevation surveys on the site in the "rough cleared" condition were conducted in 1980 and compared to conditions prior to harvesting of the site.

Hydrologic Analyses to Correct for Submerged Weirs

Outflow rates from each site were determined by measuring the stage upstream from triangular weirs as discussed previously. These methods worked satisfactorily when the outlet canal had sufficient capacity to remove the water from the area without an excessive rise in the canal water level. However the outlet water level did rise, during several extended wet periods and large rainfall events, to a level that submerged the weirs and invalidated the procedures used to measure outflow. These conditions occurred on sites 106 and 101 more frequently than others but affected all sites.

A computer simulation drainage model developed for shallow water table soils was used to estimate outflow volumes for the period of submergence. The model, DRAINMOD (Skaggs, 1978), uses measured climatological and soil property data to predict water table elevation, surface and subsurface runoff. In this application, input data for drainage system parameters and measured soil properties were compiled for each site. Then the model was used with measured rainfall data to predict outflows for a submergence-free calibration period of at least six months. Predicted outflows were compared to the observed and, when necessary, adjustments were made in the model parameters to fit the measured outflows. An example of predicted and measured cumulative runoff for the calibration period is given in Figure 4. Observed and predicted water tables were also compared for the calibration period.

Simulations were conducted for periods of weir submergence. Water table records were normally valid for that period so predicted and measured water table elevations were compared and additional adjustments made when necessary. The total predicted outflow for the storm causing submergence was assumed to be correct. Measured runoff for the storm prior to submergence was subtracted from the total predicted and the remainder was substituted for the submerged period. An example of predicted and observed water table elevations is given in Figure 5.

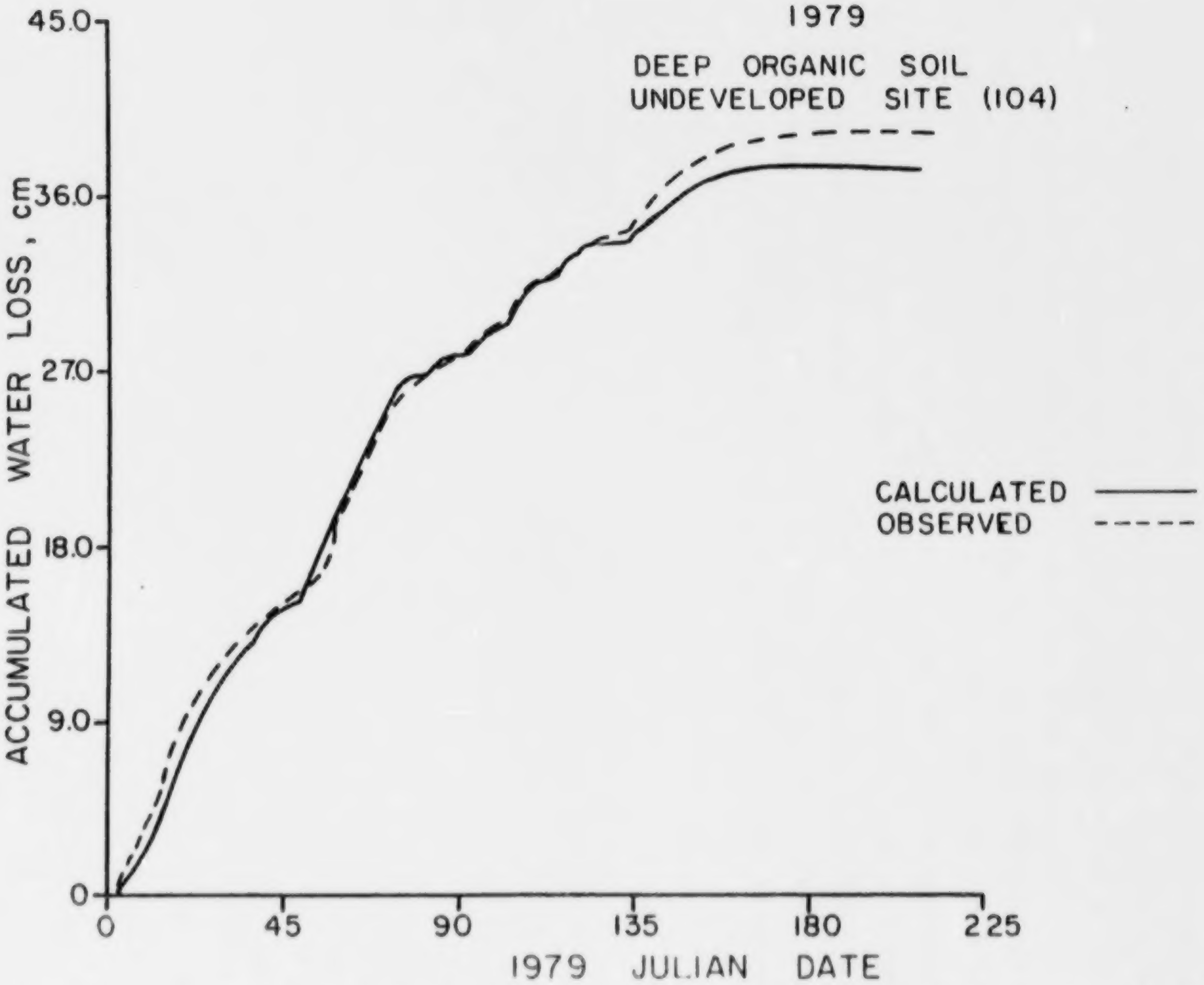


Figure 4. Comparison of calculated and observed cumulative runoff from the undeveloped deep organic site.

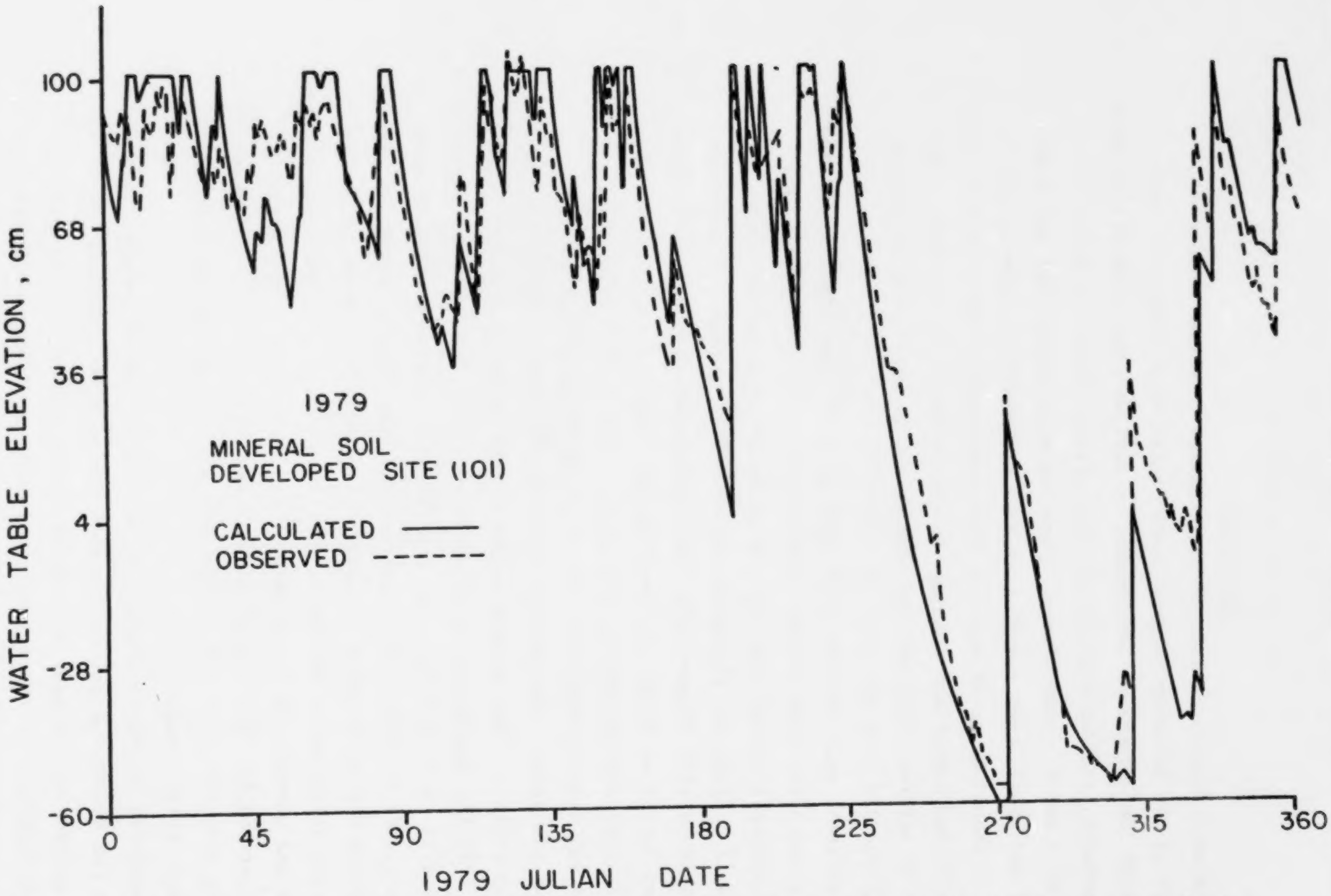


Figure 5. Comparison of calculated and observed water table elevations for the developed mineral site.

RESULTS AND DISCUSSION

Hydrology

The most dramatic effect of agricultural land development on hydrology is the increase in peak runoff rates from field size units. Examples of the effects of development on outflow rates from paired sites on the mineral, shallow organic and deep organic soils are given in Figures 6, 7 and 8, respectively. Examples were chosen that had equal rainfall and significant runoff from both developed and undeveloped sites. It should be noted that the flow measurements included both surface runoff and subsurface drainage to the outlet ditch or canal. This quantity is referred to herein as runoff, but is understood to include the total outflow from the site.

In general, peak outflow rates were three to four times higher for the developed sites than for the undeveloped on all soil types. For example, the peak runoff rate for the 62 mm storm on day 213 (Aug. 1, 1978) was 11.6 L/sec for the developed site (101) versus 3.0 L/sec for the undeveloped site (Figure 6a). The differences for smaller rainfall events may not be as large, as shown by the results for storms on July 21 and 25 (days 203 and 206) in Figure 6a. Peak runoff rates from developed and undeveloped sites were compared for storms occurring throughout the study. The results for selected runoff events are summarized in Table 4. Events were selected that produced a runoff hydrograph on both the developed and undeveloped sites; that were the result of at least 15 mm of rainfall; and that did not involve periods of weir submergence. Fewer events are given for the deep organic sites (103 and 104) than for the other soils because of frequent differences in rainfall on the sites which were 8 km apart. Ratios between peak runoff rates from developed and undeveloped sites ranged from 1 to 5.7 with the highest values occurring for the mineral and shallow organic soils. The means of the ratios were 3.0, 2.7, and 3.0 for the mineral, shallow organic and deep organic soils, respectively.

In addition to higher rates, the peak runoff values usually occurred sooner on the developed than on the undeveloped sites (Figures 6 - 8). The time advance of the peak depends on characteristics of the rainfall event, its direction of travel, etc., as well as the characteristics of the site. Typically, the peak was advanced by 24 hours on the 130 ha

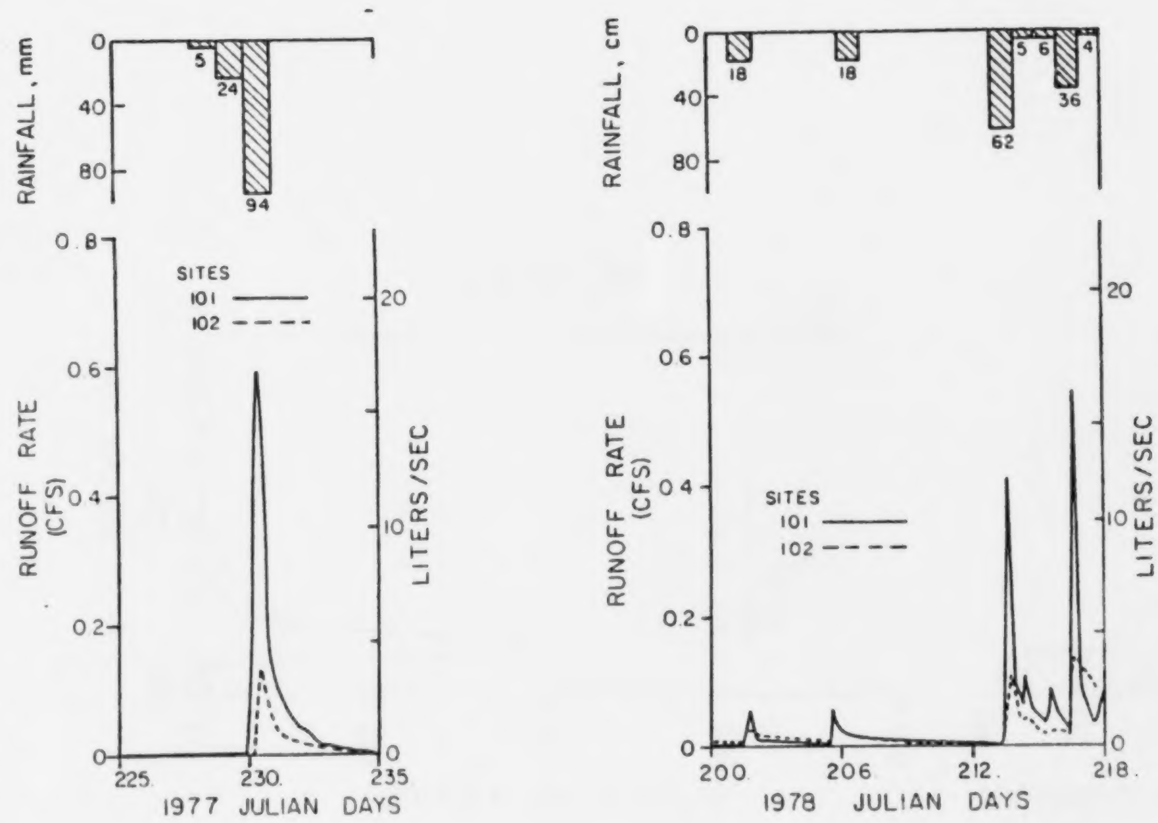


Figure 6. Runoff hydrographs for developed and undeveloped mineral soils.

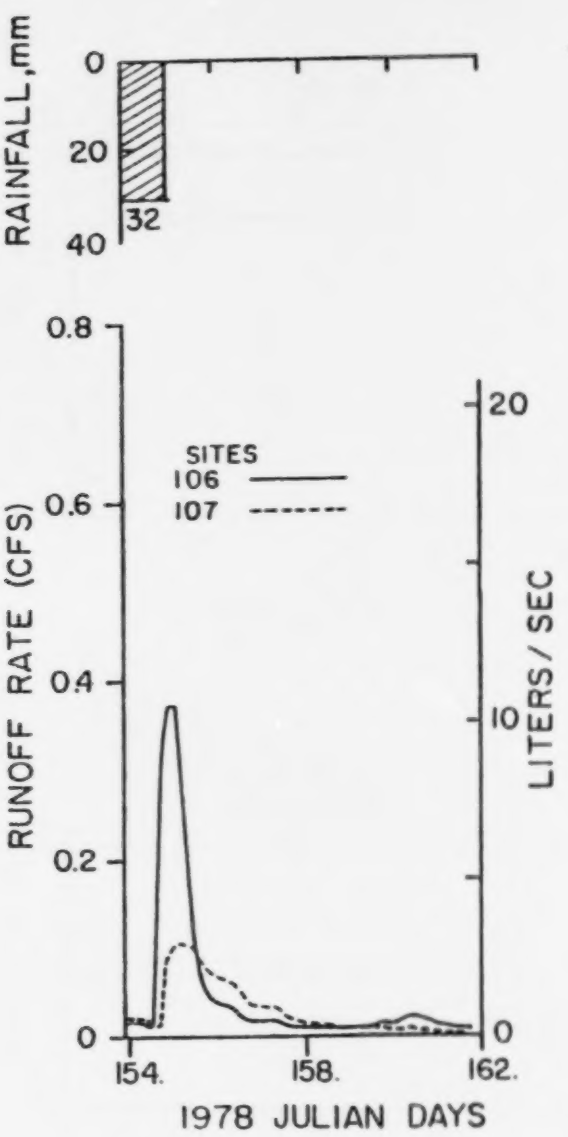


Figure 7. Runoff hydrographs for developed and undeveloped shallow organic sites.

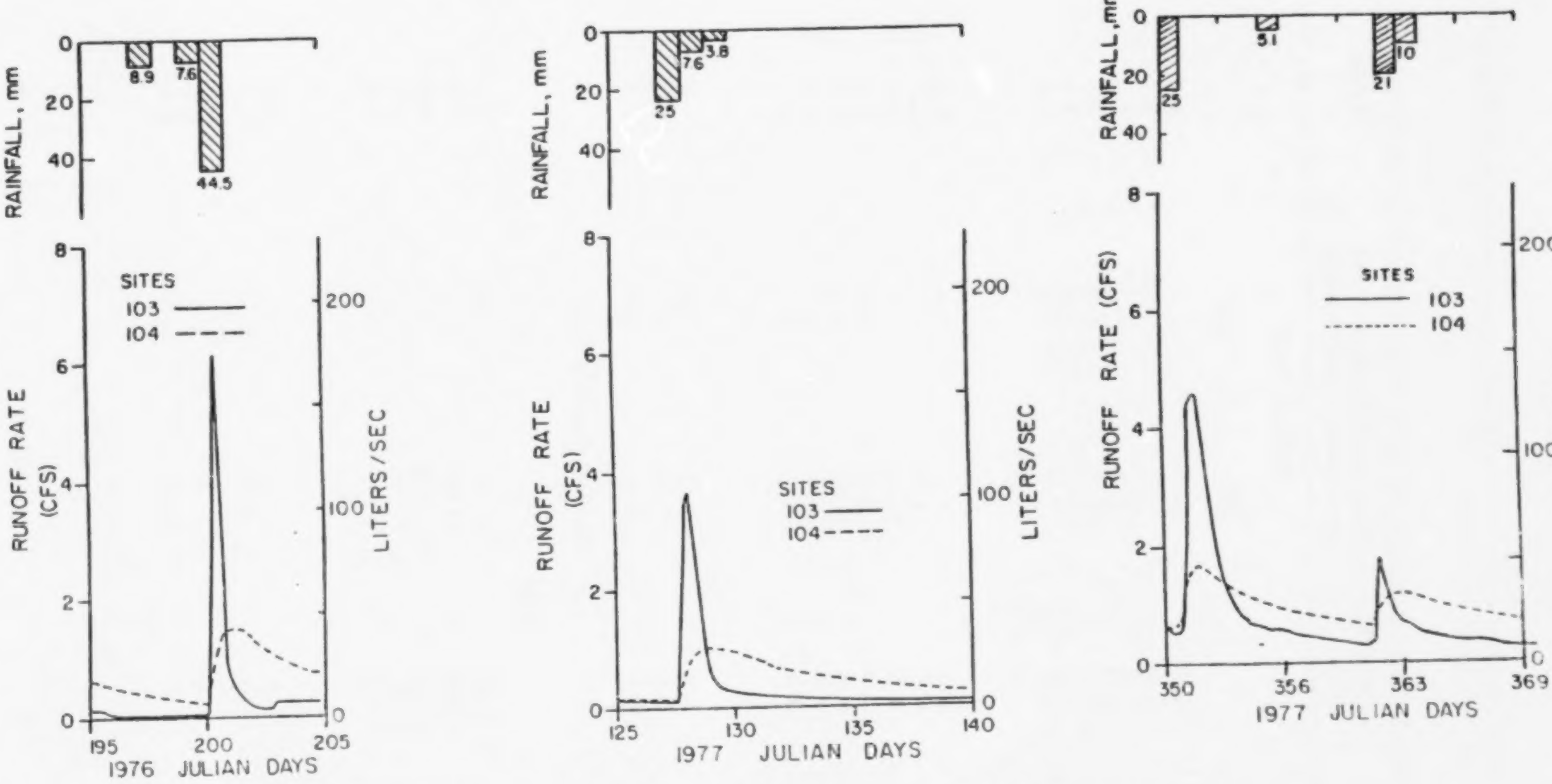


Figure 8. Runoff hydrographs for developed and undeveloped deep organic sites.

Table 4. Peak outflow rates for selected runoff events from developed and undeveloped sites.

Date	Rainfall (cm)	Peak Outflow Rate (L/s) Developed	Peak Outflow Rate (L/s) Undeveloped	Ratio
		Mineral Soil		
1977	Site	101	102	
8-17, 18	11.8	16.6	3.7	4.5
9-8, 9	5.5	2.4	0.76	3.1
10-26	3.8	4.2	1.3	3.3
10-29	4.7	15.1	4.6	3.3
11-4, 5	1.6	4.5	1.4	3.2
12-18, 19	2.4	2.8	1.6	1.8
1978				
3-3	2.7	15.2	4.4	3.4
3-26, 27	6.7	9.9	7.4	1.3
4-26	5.5	15.0	5.2	2.9
7-12	7.0	9.1	3.4	2.7
8-1	6.2	11.6	3.0	3.9
8-5	3.6	15.6	3.8	4.0
12-24	4.4	16.4	2.9	5.7
1979				
6-1	2.7	2.8	2.8	1.0
6-4	1.6	3.1	2.7	1.2
7-19	5.3	4.2	1.4	2.9
		Shallow Organic Soil		
1977	Site	106	107	
1-10	2.3	18.7	5.94	3.1
3-6, 7	3.9	18.69	5.66	3.3
3-13	3.9	27.18	7.93	3.4
9-9	15.2	83.82	17.84	4.7
12-30	3.3	5.10	2.83	1.8
1978				
3-26, 27	3.4	10.2	2.5	4.0
4-17	3.6	4.8	3.4	1.4
5-8	3.4	17.0	5.7	3.0
5-31	4.3	5.3	3.7	1.5
6-3	3.2	10.4	2.9	3.0

Table 4. (Continued)

Date	Rainfall (cm)	Peak Outflow Rate (L/s) Developed	Undeveloped	Ratio
1979		Site 106	107	
3-23	2.2	3.11	2.27	1.4
4-13	4.6	3.40	2.75	1.2
Deep Organic Soil				
1976		Site 103	104	
5-29 to 6-3	17	209	74	2.8
7-12 to 18	5.8	173	42	4.1
12-15	2.5	130	48	2.7
12-24	2.2	51	34	1.5
1977				
5-8	3.5	102	28.3	3.6
5-25	9.5	543	142	3.2
1978				
12-24	3.2	62	17	3.7

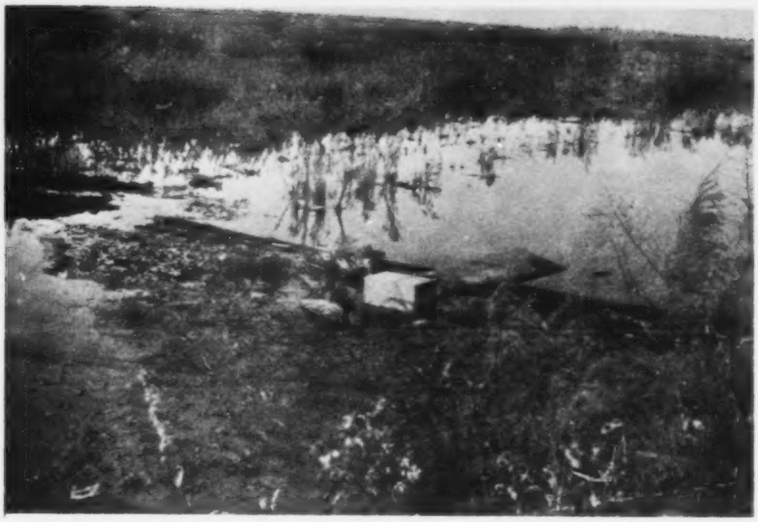
developed deep organic site (Figure 8) but by only 6 to 8 hours for the smaller (7.4 ha) mineral and shallow organic sites (Figures 6 and 7).

It is not surprising that the peak outflow rates are higher and occur earlier on the developed sites as the drainage system installed in these areas provides mostly surface drainage. The fields are sloped to ditches located 90 to 100 m apart so water that is not infiltrated moves rapidly to the drainage outlet. The soils are poorly drained internally with shallow water tables; although there are exceptions, runoff does not usually occur until the water table rises to near the surface. On the undeveloped sites, there is a thick root mat (10 to 45 cm deep composed of leaves, twigs and both living and dead plant roots) through which surface waters flow in tortuous paths before finally reaching the drainage outlet. Unlike conventional subsurface flow in soils, flow within the root mat may be concentrated, entering the outlet channel at many distinct points along its length. As water is removed from the root mat and the free surface approaches the interface with the soil mass, the flow process is assumed to gradually change to that which is governed by Darcy's law for flow in porous media. Subsurface flow may continue for long periods as shown by the recession limb of the hydrographs in Figure 8. However, this flow is derived mostly from bank storage near the open ditches. Even on developed lands where the ditches are 90 to 100 m apart, subsurface drainage is very slow.

It should be obvious that the observed increase in outflow rates for developed sites is only valid for situations in which the outlet canal network, including pumping plants in some cases, has sufficient capacity to move the drainage water away from the fields. Although the canals serving these sites did not always have sufficient capacity to prevent submergence of the weir, the analysis on peak runoff rates was conducted only for periods when the outlet was free and submergence did not occur. Outlet capacity from the experimental sites was limited during extended wet periods or periods of high rainfall. This was especially a problem during the winter and early spring months. The results show that approximately 50 percent of the total annual runoff occurs during the months of December through March.

The effect of 11.9 cm of rainfall on Nov. 4 - 6, 1977 is shown in Figure 9. The elevation of the water level in the field ditch at site 106 is plotted in Figure 10 for the flooded period. The event followed 8.5 cm of rain on Oct. 26-28 and resulted in flooding of the outlet canals for about 8 days. During that period the water level was about the same in the outlet canals as in the field ditches and even the fields themselves. Clearly, the main drainage canal system, as presently designed, does not have sufficient capacity to remove water at the rate that it could flow from developed lands during the larger runoff events. As a result the water levels in the canals and field ditches rise and drainage rates from both developed and undeveloped lands are reduced. Under these circumstances, there will be very little difference in the rate of runoff from developed and natural areas during extended periods of high runoff when much of the annual outflow may occur.

Cumulative runoff and rainfall depths for 1977 and 1978 are plotted in Figures 11 and 12 for the mineral soil; 13 and 14 for the shallow organics; and 15 and 16 for the deep organic. Monthly runoff and rainfall values are tabulated for all sites for the duration of the study in Appendix Table B. While there were relatively large differences between peak runoff rates, there was not much difference in cumulative outflow



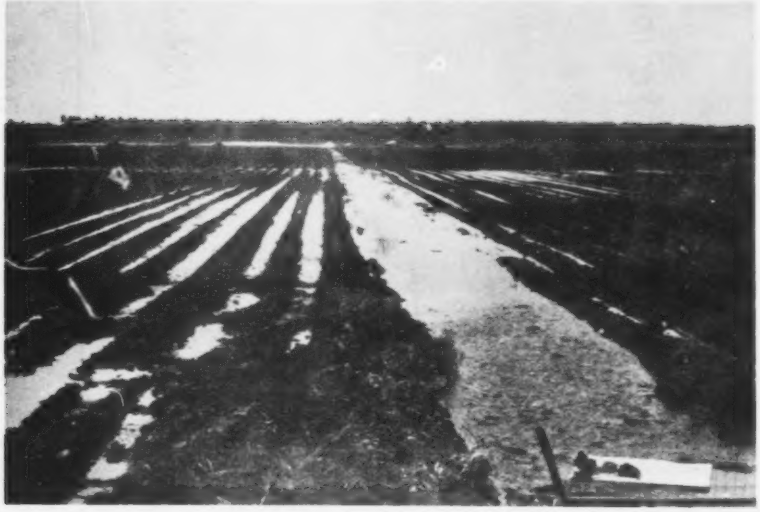


Figure 9. The outlet canal at the developed, shallow organic site (106) did not have sufficient capacity to remove 11.9 cm of rainfall in November 1977. The event was preceeded by heavy rainfall in late October (upper photograph). The lower photograph shows similar flooding in the spring of 1979.

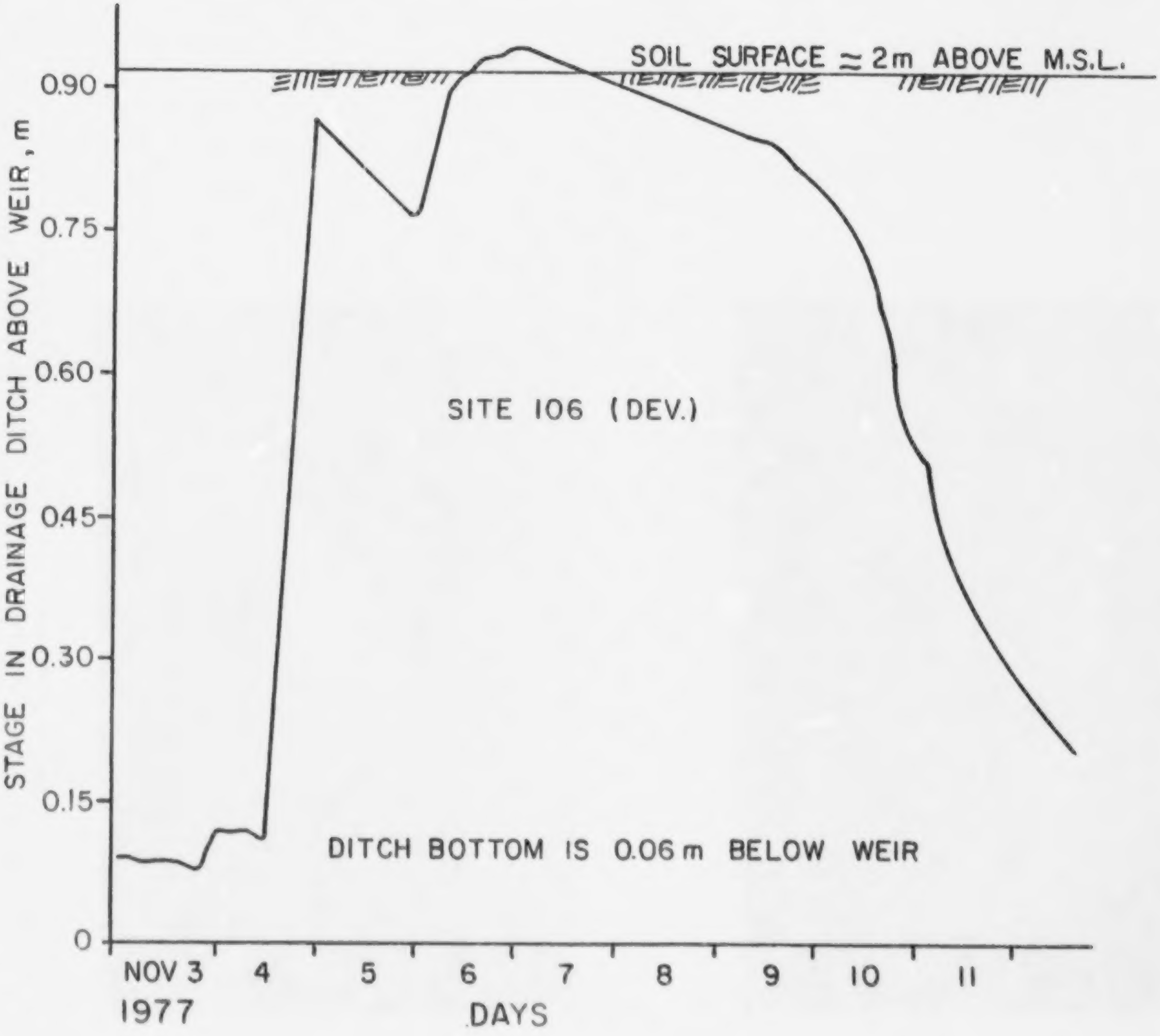


Figure 10. Stage in the drainage ditch and outlet canal (and most of the field) following heavy rainfall on Nov. 4-6, 1977.

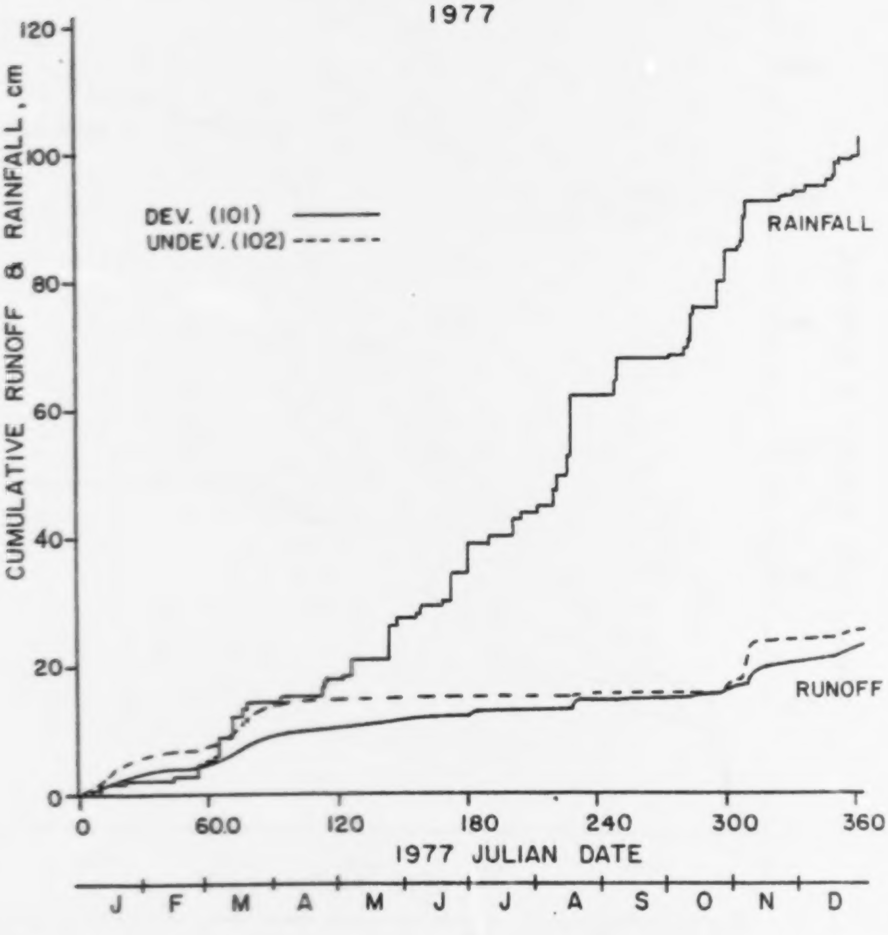


Figure 11. Cumulative runoff and rainfall for developed and undeveloped sites of the mineral soil during 1977.

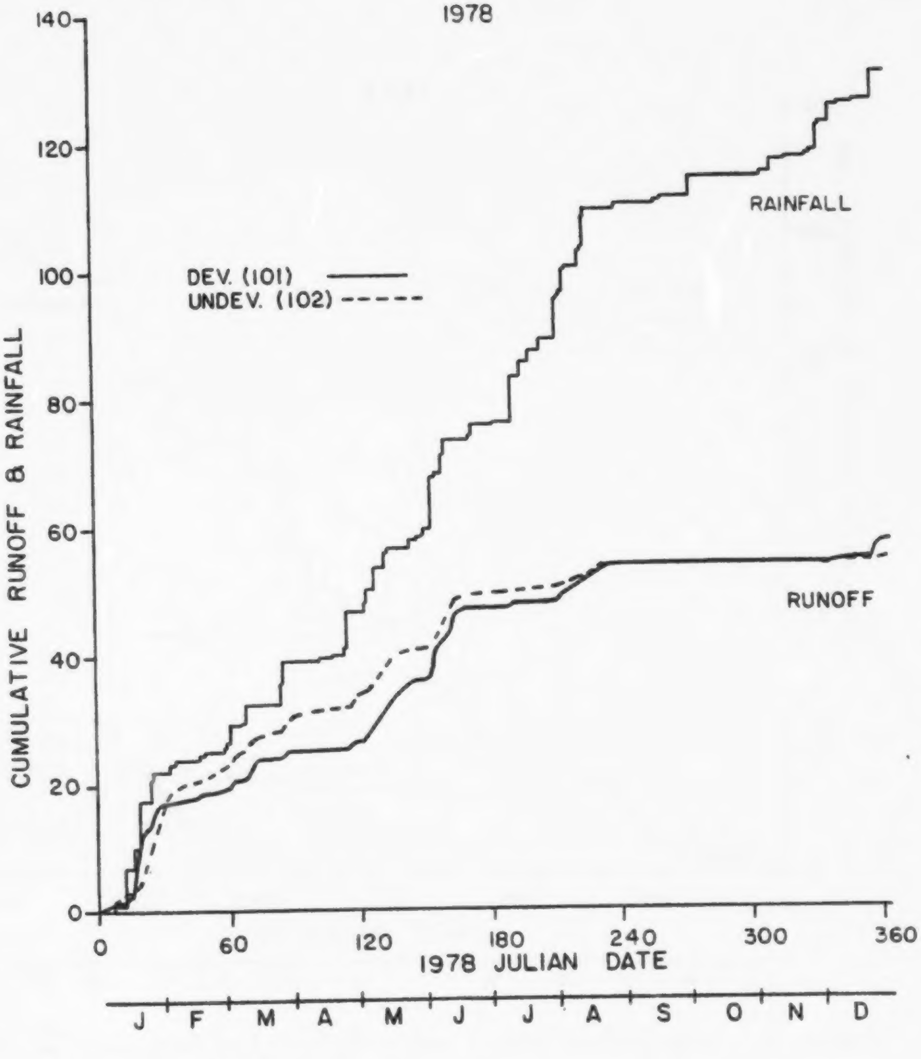


Figure 12. Cumulative runoff and rainfall for developed and undeveloped sites of the mineral soil during 1978.

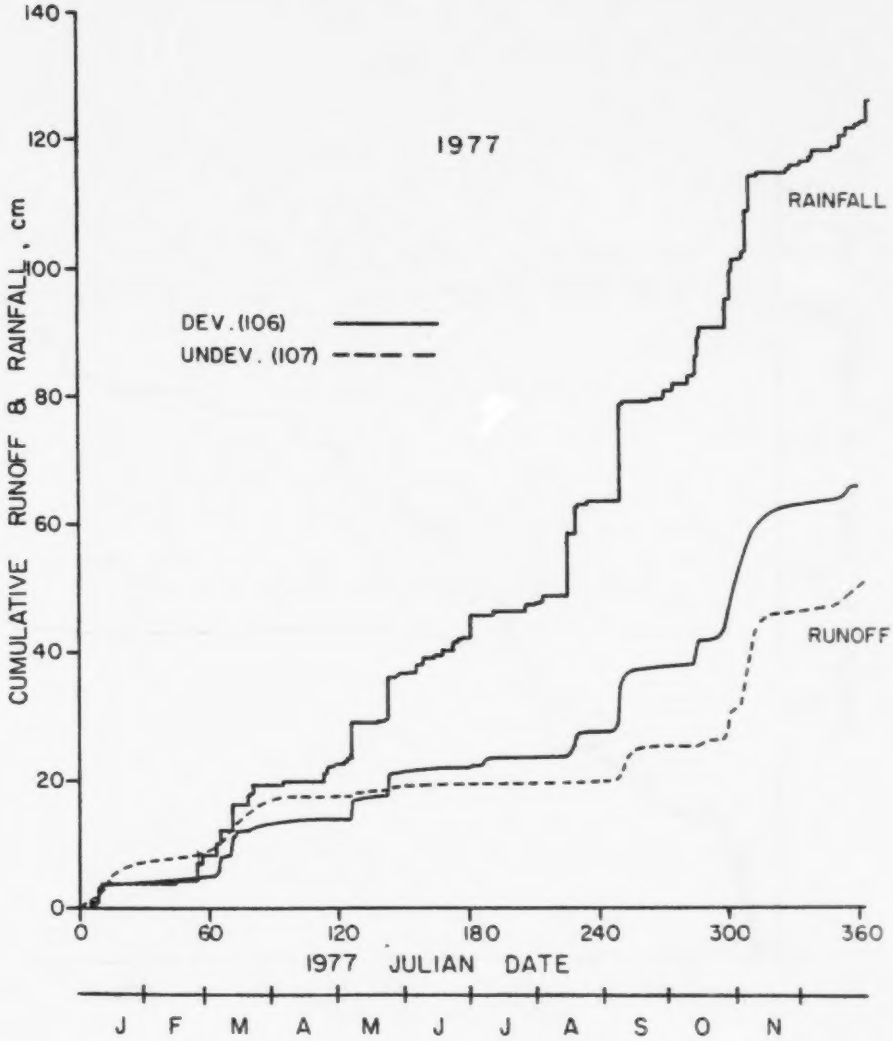


Figure 13. Cumulative runoff and rainfall for developed and undeveloped sites of the shallow organic soil during 1977.

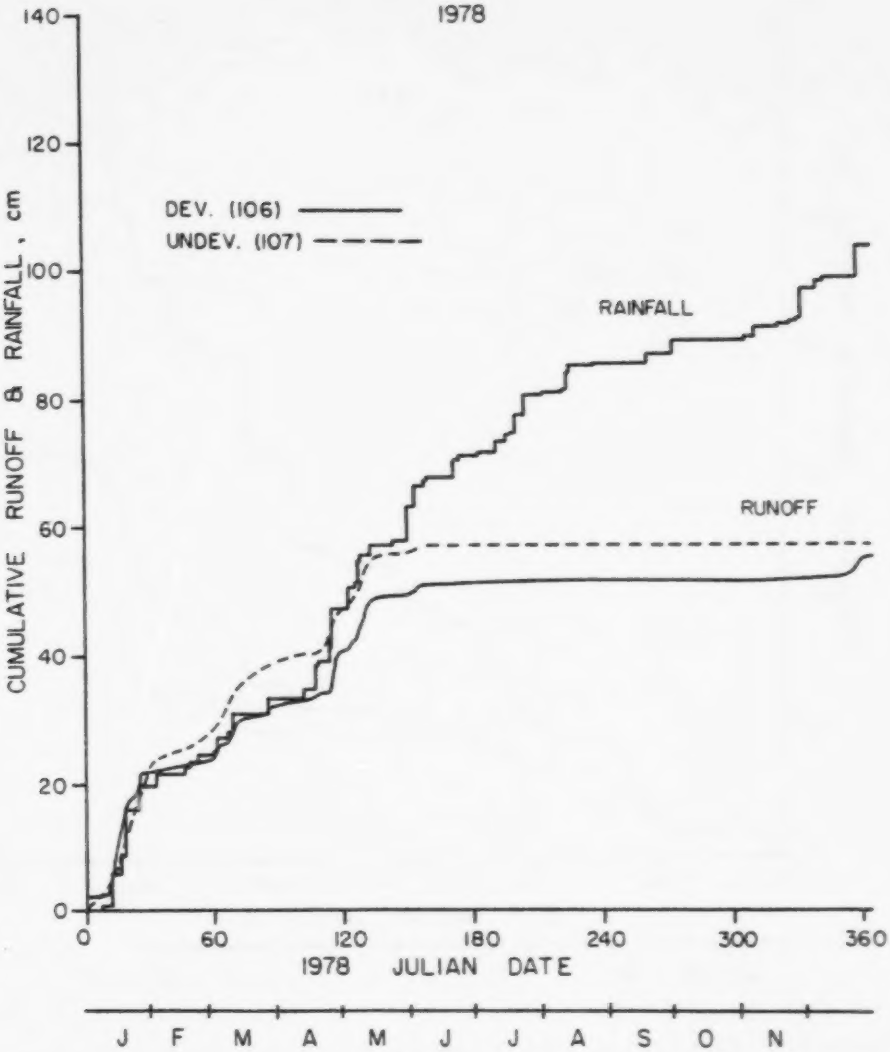


Figure 14. Cumulative runoff and rainfall for developed and undeveloped sites of the shallow organic soil during 1978.

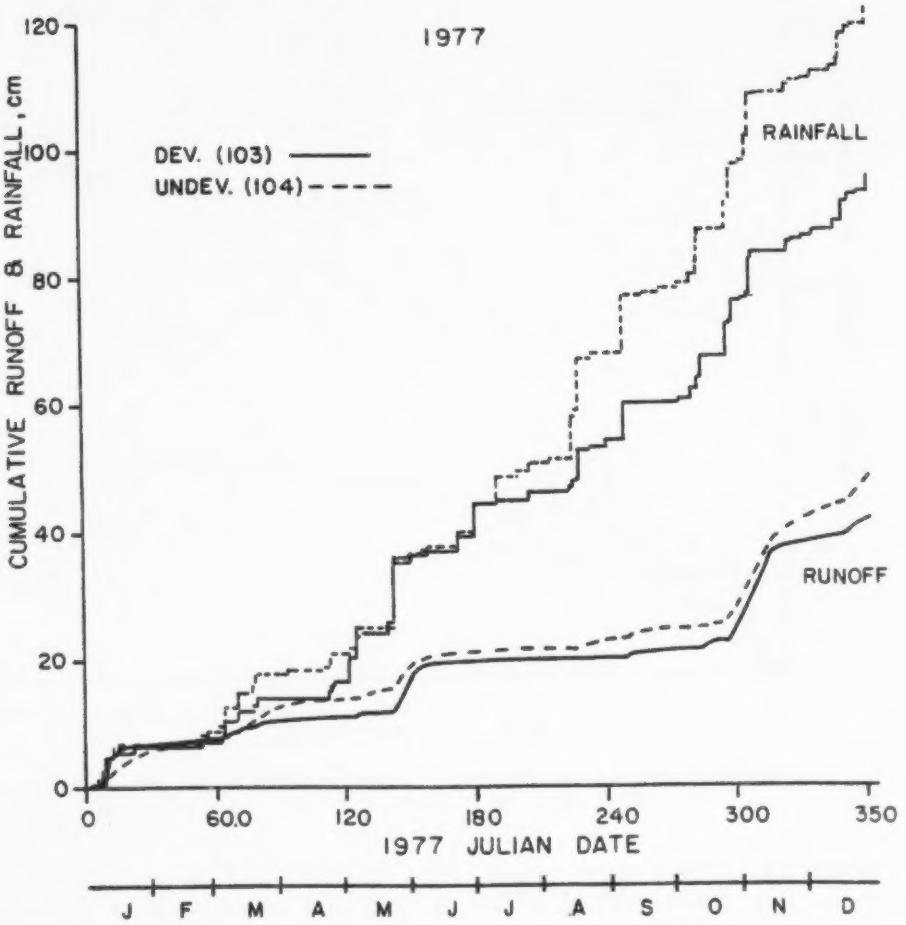


Figure 15. Cumulative runoff and rainfall for developed and undeveloped sites of the deep organic soil during 1977.

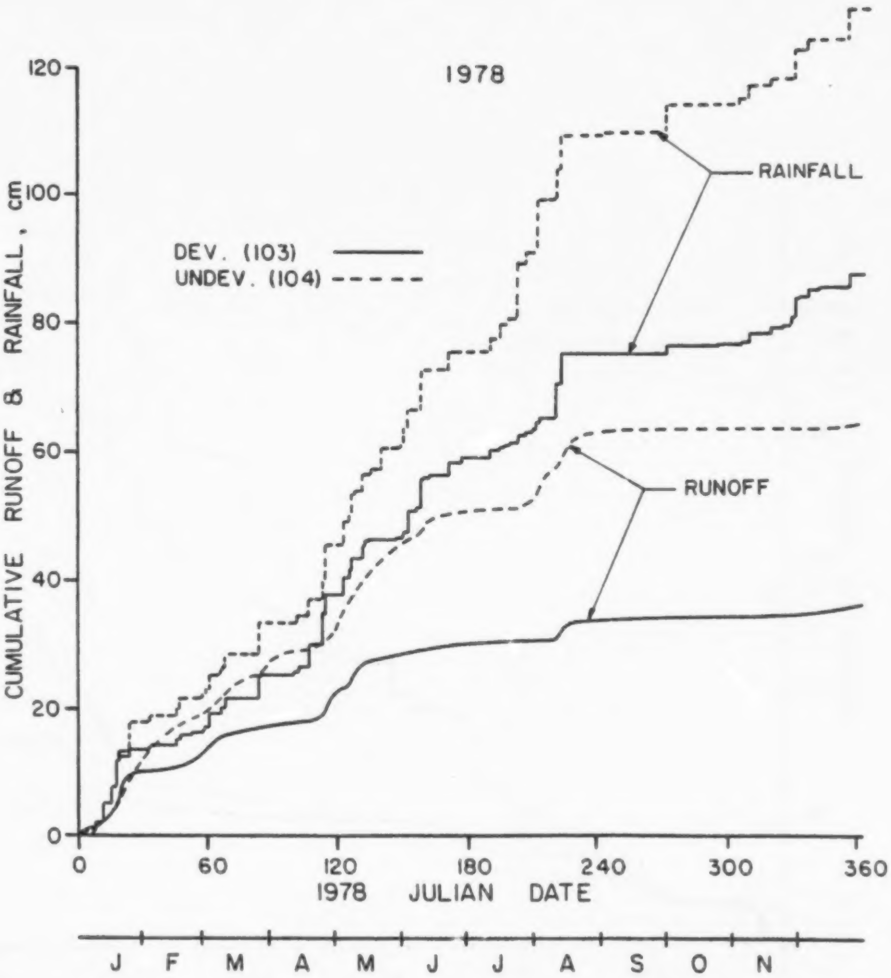


Figure 16. Cumulative runoff and rainfall for developed and undeveloped sites of the deep organic soil during 1978.

from developed and undeveloped sites as shown in Figures 12 through 16. The developed site for the mineral soil (site 101) was cleared and developed in June, 1977, so the runoff curve in Figure 11 represents undeveloped conditions for the first six months and developed conditions for the rest of the year. The runoff events in the latter half of the year are more abrupt, indicating higher runoff rates, than during the first part of the year when the site was undeveloped and runoff characteristics of the two sites were similar.

Total annual runoff from the developed site of the mineral soil was slightly higher than from the undeveloped for both 1977 and 1978 (Figures 11 and 12). The difference was greater for the shallow organic soil in 1977 (Figure 11), but, in 1978, the undeveloped shallow organic site had slightly more runoff than the developed (Figure 14). The largest difference in runoff between developed and undeveloped sites occurred in 1978 for the deep organic soils. In this case the natural site had 28 cm more runoff than the developed site (Figure 16). The natural site also had more runoff in 1977 (Figure 15), although the difference was much smaller (7.5 cm) than in 1978. The difference in total runoff in both years is attributed to differences in the amount and temporal distribution of rainfall. Although the sites were only 8 km apart, there were 26 cm and 40 cm more rainfall on the natural than on the developed site in 1977 and 1978, respectively.

In a conventional hydrologic analysis, surface runoff is assumed to begin when the rainfall rate exceeds the infiltration capacity of the soil and surface depressional storage has been filled. A frequently cited effect of agricultural development is that cultivated soils are exposed to the impact energy of rainfall which reduces the infiltration capacity and increases runoff. However this effect does not appear to be important for the organic and high organic mineral soils of this study. The organic soil surface is loose and the infiltration capacity is usually high. The surface is not compacted by rainfall to the extent that it is in most mineral soils. Furthermore the fields are flat and it takes a relatively long time for water to run off of the field surface, which extends the time available for infiltration. In most cases, infiltration continues until the water table rises to the surface before surface runoff starts. Surface runoff rarely occurs from developed sites of these soils before the water table has risen to the surface. This may be observed by studying the runoff plots (Figures 11 - 16) in combination with plots of the water table (Figures 17 - 19) and Appendix Figures A1 - A8.

One of the primary factors affecting runoff from an individual storm is the antecedent soil water condition. If the water table is deep and soil conditions dry when rainfall occurs, a large portion of the water may be stored in the profile rather than running directly off the surface, or draining through the root mat on the natural sites. Because subsurface drainage is poor for the soils in this study, the antecedent soil water status is primarily affected by water lost by evapotranspiration (ET). In turn, ET is controlled by climatological factors, soil water conditions, and the ability of the crop or native vegetation to extract water from the soil profile.

Evapotranspiration from the experimental sites can be estimated from a water balance as,

$$ET = R - RO - \Delta S - DS,$$

where R is rainfall, RO is runoff, ΔS is the increase in soil water stored in the profile and DS is deep seepage.

Deep seepage was assumed negligible and ET calculated for each calendar year of the study. ΔS was evaluated from the observed water table depths at the beginning and end of the year by using the water yield relationships for the appropriate soil (see the subsequent section on soil properties). Results for rainfall, runoff, ΔS and ET are tabulated in Tables 5, 6 and 7 for the mineral, shallow organic and deep organic soils, respectively. Except for the mineral soil in 1979 (Table 5), the computed ET values were always higher on the natural than on the developed sites.

The availability of soil water to plants is strongly dependent on the depth of the root zone. The unlimed organic soils have a low pH (approx. 3.8) and crop rooting depths are limited to the depth of lime incorporation, about 20 cm in most cases. While rooting depths of the native trees and shrubs on natural sites may be somewhat greater than agricultural crops, they are still limited by high water tables and acid subsoils. Under the same rainfall conditions, the combination of improved drainage and a shallow root zone on developed soils may cause a

Table 5. Summary of rainfall, runoff and ET for developed (101 and undeveloped (102)) mineral soil sites during each year of the study.

Year	Rainfall (cm)	Runoff (cm)	Change in profile storage (cm)	ET (cm)
1977				
101*	102.8	26.0	0.0	76.8
102	102.8	23.4	1.8	77.6
1978				
101	130.8	57.2	-1.1	74.7
102	130.8	55.1	-4.0	79.7
1979 (Jan. 1 to Aug. 1)				
101	90.8	34.9	-3.5	59.4
102	90.8	34.9	-0.9	57.3

*Site 101 was cleared and developed in June, 1977, so it was in the natural state for about one-half year and developed state for one-half year.

Table 6. Summary of rainfall, runoff and ET for developed (106) and undeveloped (107) shallow organic sites during each year of the study.

Year	Rainfall (cm)	Runoff (cm)	Change in profile storage (cm)	ET (cm)
1976 (July 1 to Dec. 31)				
106	63.6	28.3	0	35.3
107	63.6	21.0	0	42.6
1977				
106	126.0	69.6	0.2	56.2
107	126.0	51.6	0.2	74.6
1978				
106	104.0	55.0	-0.5	49.5
107	104.0	57.4	-5.1	51.7
1979 (Jan. 1 to Aug. 31)				
106	79.8	38.5	-2.1	43.4
107	79.8	34.9	-1.0	45.9

Table 7. Summary of rainfall, runoff and ET for developed (103) and undeveloped (104) deep organic sites during each year of the study.

Year	Rainfall (cm)	Runoff (cm)	Change in profile storage (cm)	ET (cm)
1976				
103	53.1	11.6	0.7	40.8
104	58.8	8.7	2.4	47.7
1977				
103	96.4	42.5	0.2	53.7
104	121.5	50.0	1.5	70.0
1978				
103	88.1	36.9	-1.62	52.8
104	129.2	65.0	-6.5	70.7
1979 (Jan. 1 to Aug. 1)				
103	62.8	28.7	-0.5	34.6
104	72.2	38.0	-0.4	34.4

reduction in ET from that which would occur on natural sites, and a consequent increase in outflow. This response would only occur during years with dry periods of sufficient length to cause ET to be limited by soil water deficiencies. This will not usually occur in the winter and early spring months when water tables are high. Even though the natural sites are often bare during those months, the PET is low and ET is usually limited by atmospheric variables. However, such conditions may develop during the early part of the growing season before the rooting system are established, as well as after prolonged drought periods later in the season. If the drought continues for a long enough period, ET on the natural site would also be limited by soil water conditions. Subsequently, ET rates on both developed and natural sites would be small. Thus, differences in the annual ET for developed and natural conditions would be greater when several such dry periods occur during a season rather than a single drought of longer duration. That is, a single long drought would reduce ET from both sites but would tend to cause smaller differences between ET (and runoff) from developed and natural sites than would a series of shorter dry periods followed by runoff producing storms.

The latter point is illustrated by the results for the shallow organic sites in 1977 and 1978 (Table 6). In 1977 ET was about 18 cm less for the developed (106) site than for the natural (107) site. This was caused by several relatively dry periods during the interval March 21 to August 17 (days 80 to 227 in Figure 13). Each dry period was followed by storms that produced significant runoff (days 126, 144, 178 and 229) from the developed site but only barely measureable amounts from the undeveloped site. The dry periods were apparently of sufficient length to reduce ET on the developed site but had a smaller effect on the natural site. These results are in contrast to those for 1978 (Figure 14) where no runoff occurred from either site from June 10 to December 20 (days 160 to 355). In this case ET was limited by the lack of available soil water on both sites with an annual difference of only 2.5 cm. Total ET was about 50 cm on the shallow organic soil in 1978 compared to 75 cm for the same year on the mineral sites where rainfall was higher (Table 5). Therefore, the lack of sufficient soil water reduced ET by about 25 cm on both developed and natural shallow organic sites during 1978.

Differences in ET were small for all years on the mineral sites (Table 5). Although rainfall on the site was relatively low in 1977, the dry periods occurred early in the year before the site was cleared. Rainfall was sufficient to eliminate drought conditions during the remainder of the year.

Although the natural deep organic site (104) had more runoff than the developed site (103), it also had higher ET for all years (Table 7). Rainfall was higher on the undeveloped site in every year, and particularly in 1977 and 1978 as shown in Table 7. The smaller amount of rainfall on site 103 caused ET to be limited more frequently than on the natural site 104. The resulting ET on site 103 was about 25 percent less than on the site 104 for both 1977 and 1978. Rooting depth on this site is totally limited to the depth of lime incorporation on this soil type. Generally the depth of lime incorporation is shallower in this soil than in others because of the large quantity of buried wood. Thus crops on the deep organic soil are susceptible to more frequent drought stress during the year.

No explanation is given for the consistently smaller annual rainfall measured on site 103 as compared to that on site 104. The rain gauges were installed according to standard procedures and the calibration checked in 1976, 1977, and 1980. Since the rainfall from 103 was lower than data from the other sites, it was compared to measurements conducted at three additional sites located within 2.5 km of the 103 site. Annual rainfall amounts from these sites were higher than measured at 103 but lower than that measured at 104. For example, in 1978, 95 cm of rainfall were measured at the old pasture research site 2 km north of 103 and 107 cm were obtained for the peat harvesting site 2.5 km north of 103. A USGS station 2 km west of 103 showed 114 cm of rainfall for the same period. These data may be compared to our measurements of 87 cm on site 103 and 128 cm on 104. At least part of the difference was due to July thunderstorms which occurred on the surrounding sites but missed 103. Although the consistently smaller rainfall amounts measured on site 103 is worrisome, we can find no objective reason for rejecting these data.

The average rainfall amounts for the duration of the study were 126, 98, 124 and 121 cm/year for sites 101, 103, 104 and 106, respectively. Except for site 103, these values compare well with the long term average for the area of 127 cm/year. Thus hydrologic events and pollutional loadings observed during the study should be typical of that expected over the long term.

Water Table Depth

The effect of the drainage systems currently used in N. C. organic soils on water table depth is often misunderstood. A popular misconception is that field drainage ditches, usually placed 90 to 100 m apart in these soils, lowers the water table to the level of the water in the ditches, approximately 1 to 1.5 m below the soil surface. In fact the water table elevation changes continuously and rarely falls to the depth of the ditch. The soils are tight with subsoil hydraulic conductivities of about 0.02 m/day (c.f. subsequent section on soil properties) and the drainage systems installed serve primarily for surface drainage. Some subsurface drainage is obtained, but drains would have to be placed 10 to 15 m apart to provide subsurface drainage comparable to conventional improved drainage in mineral soils. Even then the water table would not be drawn down to a constant

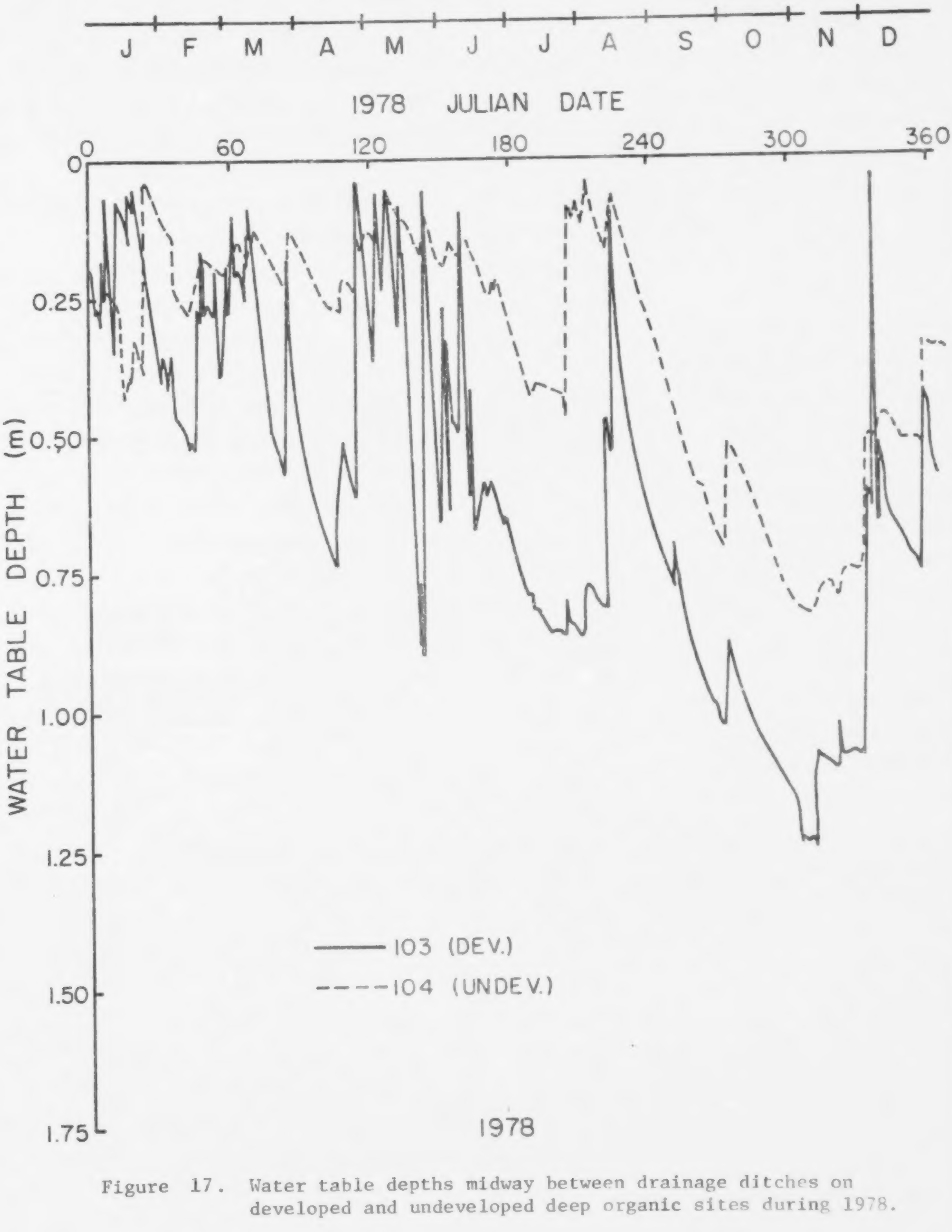


Figure 17. Water table depths midway between drainage ditches on developed and undeveloped deep organic sites during 1978.

depth but would vary over time with rainfall and ET.

Water table depths measured near the center of the deep organic, mineral and shallow organic sites are plotted for 1978 in Figures 17, 18, and 19, respectively. Plots for 1976, 1977 and 1979 are given in Appendix Figures A1 - A8. Note that, with the exception of the undeveloped shallow organic soil, the water tables on both developed and undeveloped sites are close to the surface during the winter and early spring months and have varying, but deeper depths during the summer and fall. Subsurface drainage on all of the developed sites is slow and the primary mechanism causing water table drawdown is ET. Good surface drainage on the developed deep organic site (site 103, Figure 17) allows water table drawdown to begin soon after rainfall ceases. Whereas, surface water is removed much more slowly from site 104 and water table drawdown is delayed. Furthermore, the drainable porosity is higher for natural than for developed soils (Table 46) so more water must be removed to lower the water table on undeveloped than on developed sites. Average water table depths are given for each year of the study in Table 8. In 1978, the average depth to the water table on site 103 was 0.58 m as opposed to 0.33 m on the natural site 104. Differences between these two sites were even less during the other three years of the study (Table 7). However this 0.25 m difference was not entirely due to drainage, as site 104 had 41 cm more rainfall in 1978 (Table 7) than did the developed site 103.

Table 8. Yearly average water table depths (m) near the center of developed and undeveloped sites.

Year	Mineral		Deep organic		Shallow organic	
	Dev. (101)	Undev. (102)	Dev. (103)	Undev. (104)	Dev. (106)	Undev. (107)
1976 (8-1 to 12-31)	-	-	0.63	0.44	0.28	0.87
1977	0.49	0.74	0.58	0.38	0.40	0.89
1978	0.52	0.73	0.58	0.33	0.66	1.18
1979 (1-1 to 8-31)	0.50	0.48	0.51	0.29	0.835[*]	1.14[*]

[*] Averages based on data from 3-5 to 8-31. Measurements on 106 were not made during the first part of the year because of field grading and shaping work.

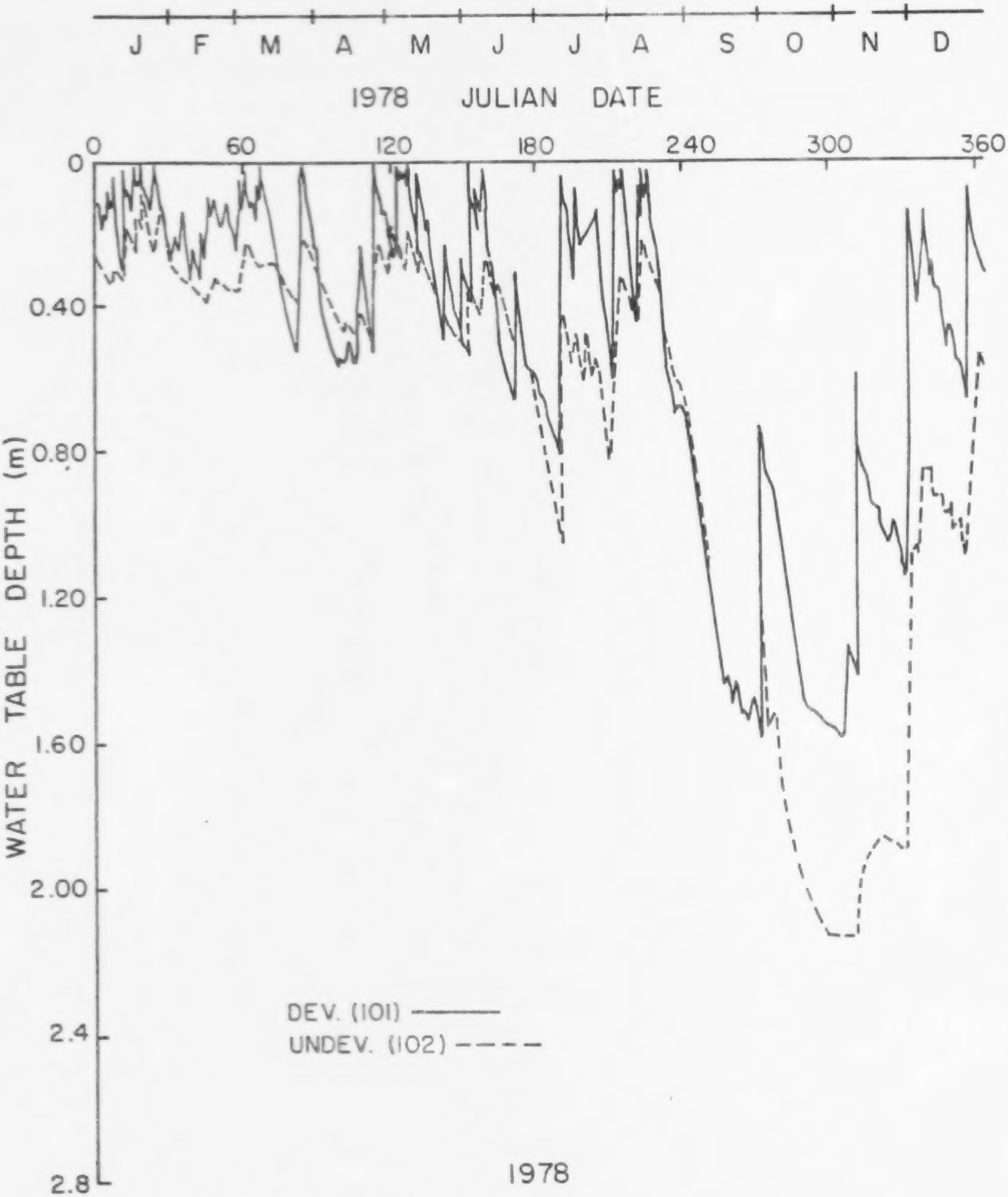


Figure 18. Water table depths midway between drainage ditches on developed and undeveloped mineral sites during 1978.

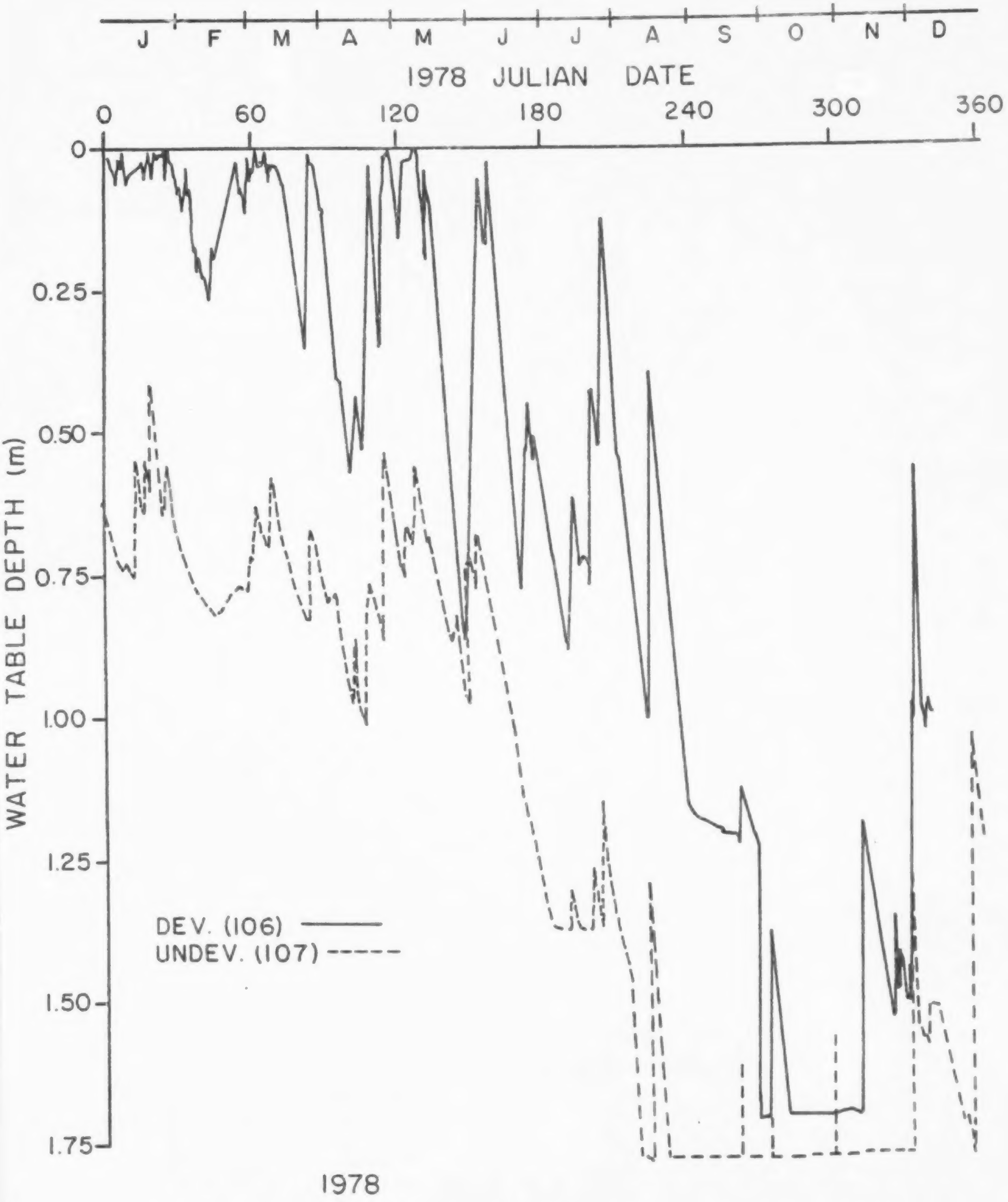


Figure 19. Water table depths midway between drainage ditches on developed and undeveloped shallow organic sites during 1978.

The water table depths on the mineral and shallow organic soils were actually deeper on the undeveloped sites than on the developed (Figures 18 and 19). This difference was dramatic on the shallow organic sites (Figure 19) with average water table depths in 1978 of 1.18 m on the natural site compared to 0.66 m on the developed site. The water table on the undeveloped site was deeper during the entire year, but particularly in the winter months when the water table on the developed site remained close to the surface. The same effects were observed, to a lesser extent, on the mineral site (Figure 18). The deeper water table depths are attributed to the influence of the root mat which may be 10 to 45 cm thick on the natural sites. Although it is unlikely that flow through the root mat is Darcian, Badr (1978) estimated its hydraulic conductivity to be 116 m/day on site 107 and 240 m/day on site 104. Sites 107 and 102 are only 90 m wide with a ditch in the center of each site so water moves through the porous mat quickly. In fact, the water table rarely rises into the root mat (Figures 18 and 19), even during very wet periods when it is coincident with the surface of the developed site. The root mat is removed during the process of development and the hydraulic conductivity of the layer just below the mat is reduced because of compaction (Table 45). Thus water moves to the lateral ditches much more slowly from the surface layer of the developed site than from the root mat and surface layer of the undeveloped site. The result is deeper water tables on sites that have been ditched for drainage, but have not yet been cleared, than on fully developed sites. If the ditches had not been constructed on sites 102 and 107, there would not have been an outlet for drainage of the porous surface layer. Under these conditions the water table on the natural sites would likely have been closer to the surface than on the developed sites - but not by much, as shown for sites 103 and 104 on the deep organic soil.

Water table depths midway between field drainage ditches and at a point 7.5 m from a ditch are plotted in Figure 20 for the developed deep organic soil (103) and in Figure 21 for the mineral soil (101). In both cases the water table depth curves are nearly coincident. The obvious exceptions are the deeper water table depths (days 200 to 230 in Figure 20 and 255 to 310 in Figure 21) when the water table depth nearest the ditches exceeded the depth of the well. Excluding these periods the

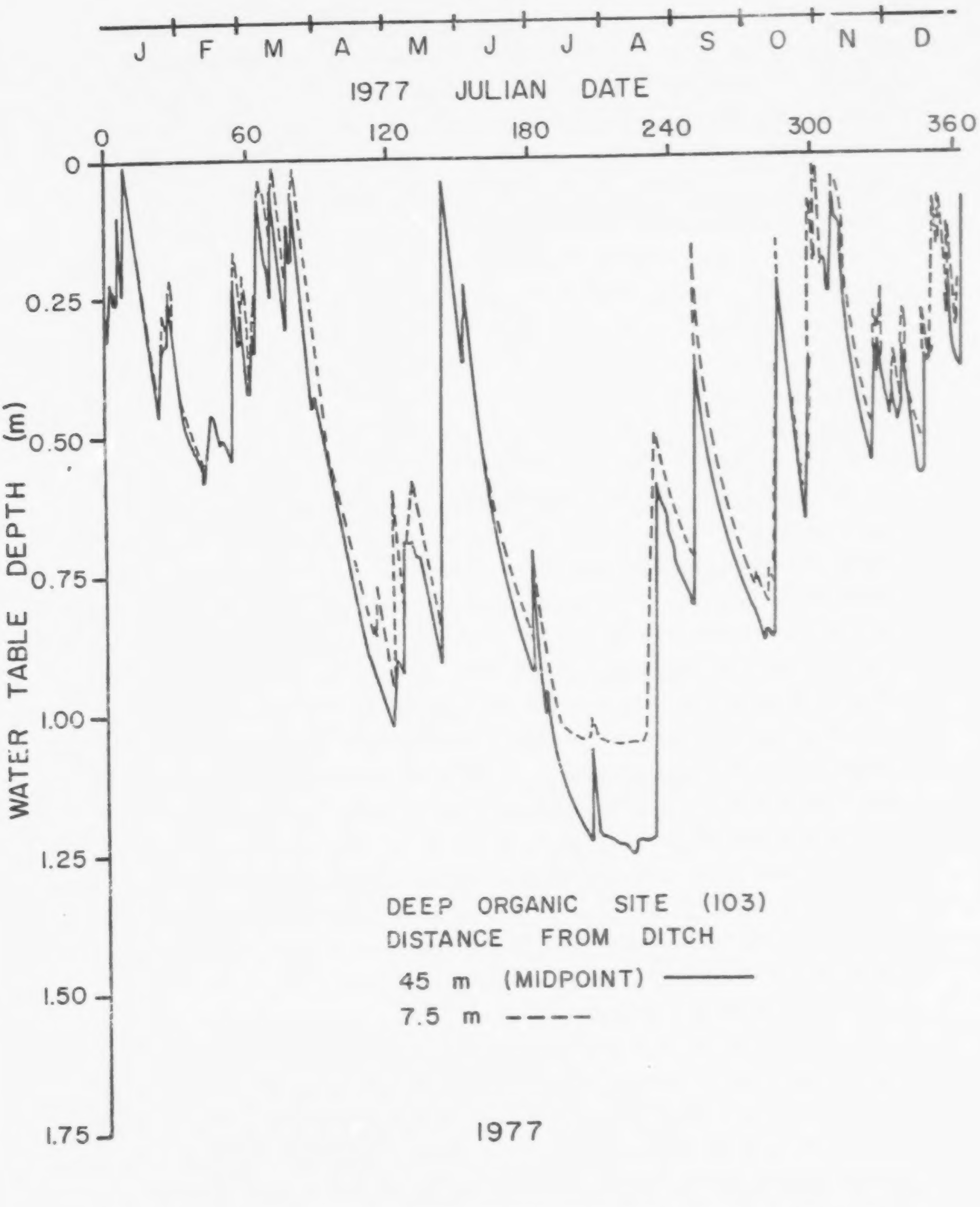


Figure 20. The water table depths midway between field ditches were nearly identical to that 7.5 m from the ditch for the developed deep organic site.

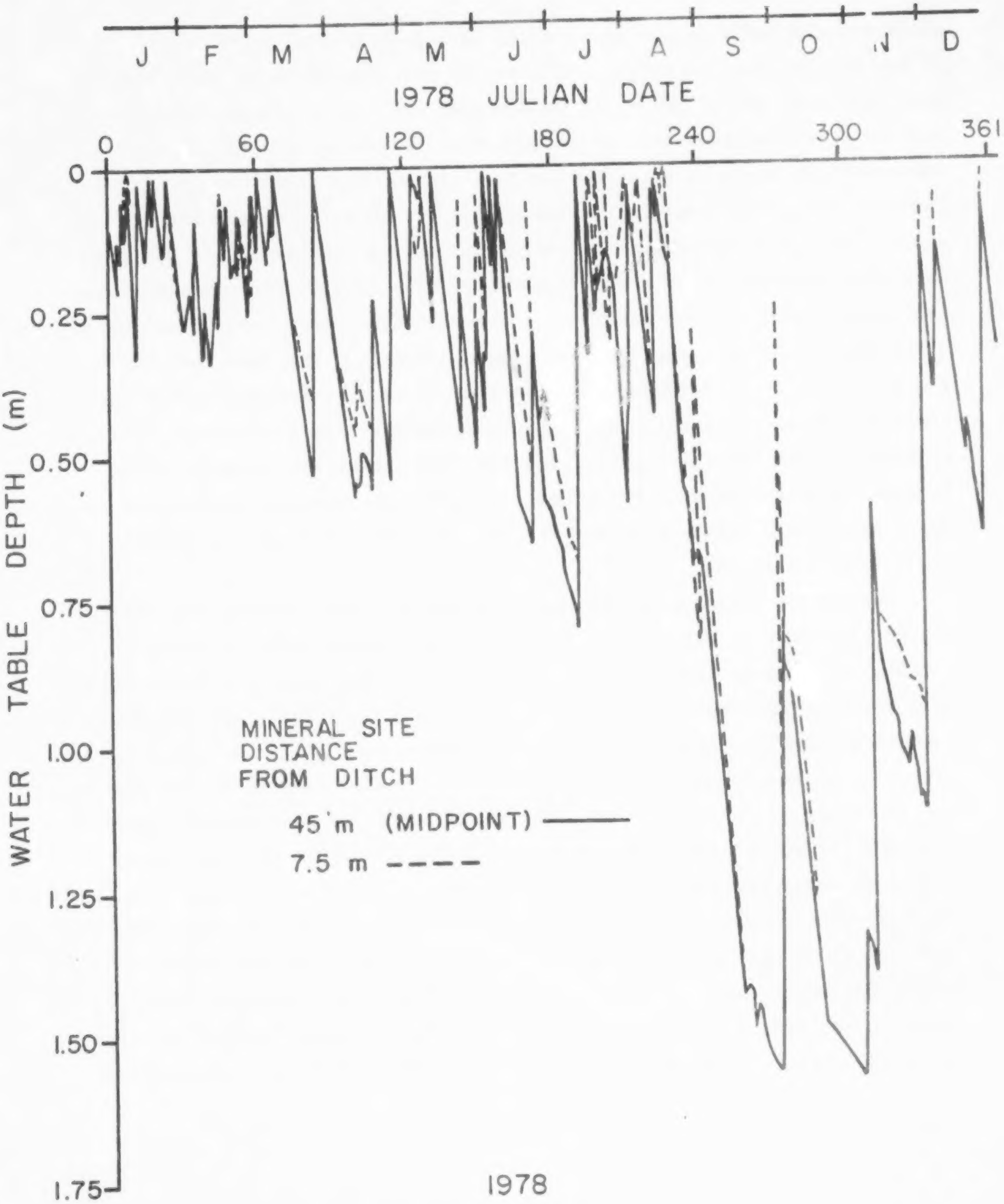


Figure 21. The average water table depth 7.5 m from the field ditch was only 4 cm greater than that midway between ditches on the developed mineral site in 1978.

average water table depths on site 103 were 0.58 m at the midpoint versus 0.55 m near the ditch. On site 101 the average water table depths were 0.52 m at the midpoint and 0.46 m near the ditch. Recall that the surface is sloped from the center toward the ditch so the surface elevation near the ditch is about 0.15 m less than at the center of the field. Thus the water table does slope toward the ditch, but the gradient is very small. The close agreement in water table depths indicates that the primary mechanism for water table drawdown is ET. If subsurface drainage was the major factor causing water table drawdown, the water table near the ditch would fall more rapidly than at the midpoint. The fact that the plots are nearly coincident indicates that ET is more important than subsurface drainage in causing water table drawdown. Similar results were obtained on the shallow organic site 106 with subsurface drainage being somewhat more important. For example in 1977, the average water table depth was 0.40 m at the midpoint of site 106 versus 0.44 m at a point 7.5 m from the ditch.

Subsurface drainage to the deeper collector canal on site 103 had a greater effect on water table depth near the canals than the field ditches. The water level in the collector canal was about 2 m below the soil surface, as compared to a 0.8 to 1.2 m depth for the field ditches. Water table depths midway between field ditches 30 m away from the collector canal and 200 m away from the collector canal (Figure 3) are plotted in Figure 22 for 1977. The water table depth was consistently deeper near the collector canal with an average depth of 0.80 m as compared to 0.58 m at the point 200 m away from the canal. Subsurface drainage to the collector canal resulted in continued flow from site 103 after flow from the field ditches had ceased. The width of the zone of influence of the collector canal increases with time after large rainfall events. Based on the hydraulic conductivity of the soil and observations at a point 75 m from the canal, the zone of influence will rarely exceed 60 m.

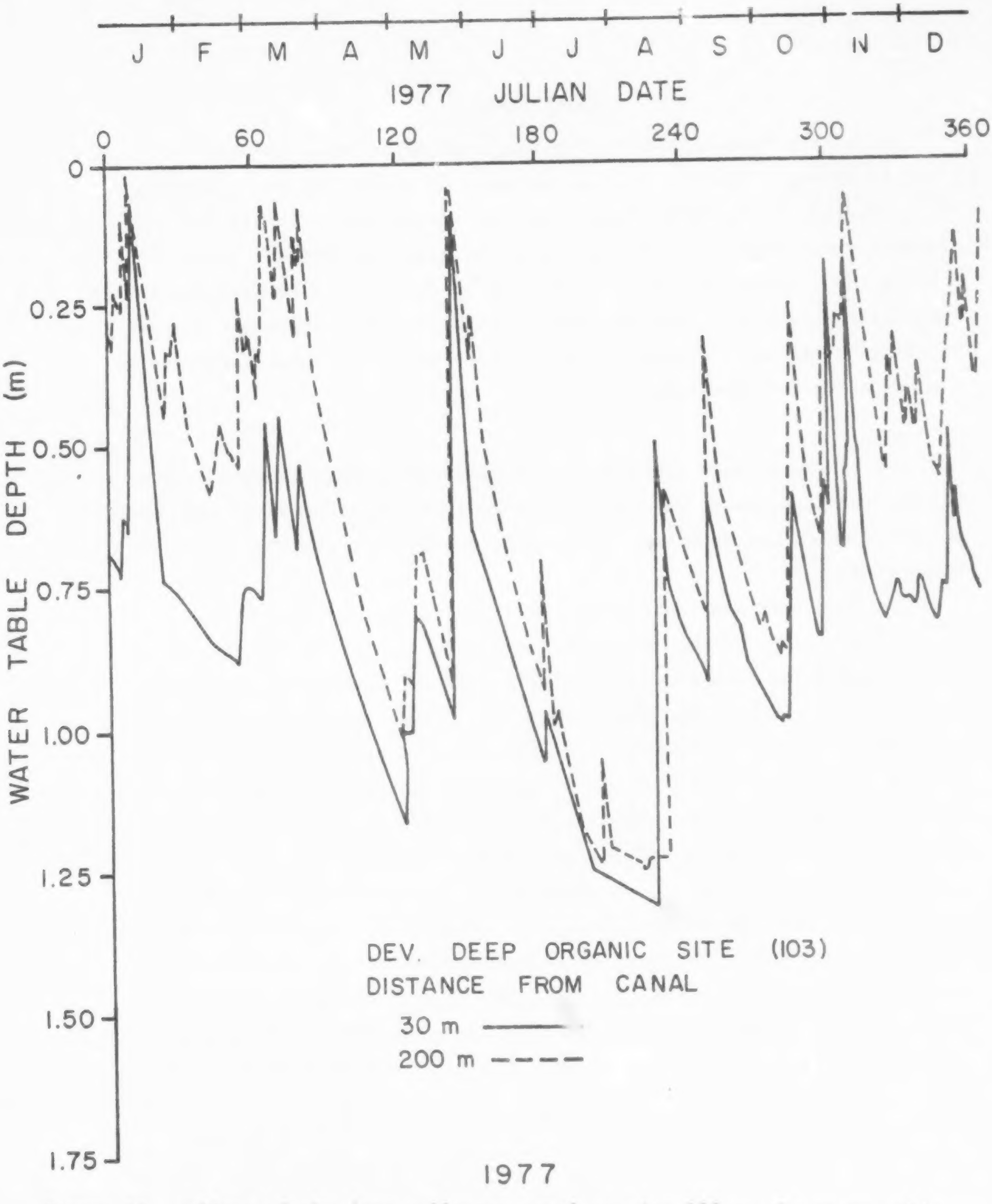


Figure 22. Effect of the deep collector canal at site 103 on the water table 30 m away as compared to the water table 250 m from the canal.

Water Quality

All of the data collected relating to drainage water quality is given in Appendix Tables. Each measurement of concentration, temperature, etc., is given in Appendix Table D and the cumulative efflux in the drainage water from the respective sites is given in Appendix Table E.

In the interest of space in the body of the report, we have summarized the data to illustrate what we consider to be the most important changes in the chemical and physical characteristics of the drainage water due to land clearing and development.

Nitrogen

One of the primary concerns of the land development in this region is that the development may speed the rate of eutrophication of the nearby estuaries which are important to the N.C. and Eastern Seaboard fisheries industries.

The fear that land development will lead to a very significant input of nutrients to the estuaries triggering an algae bloom similar to that which has occurred in Chowan River in the past few years has been expressed in both the popular press and scientific news reports. The element which has drawn the most attention is nitrogen, largely because of the work of Hobbie (1974) and Harrison and Hobbie (1974) whose work indicated that nitrogen, particularly inorganic nitrogen (NO_3 & NH_4), was limiting the production of estuaries.

The total efflux in the drainage water of nitrate-nitrogen (NO_3-N), ammonium-nitrogen (NH_4-N) and total Kjeldahl nitrogen (TKN) for each site is given in Table 9. The weighted average concentration of each nitrogen species is given in Table 10. It is apparent from the data in these tables that development leads to a significant increase in the efflux of nitrogen in the drainage waters. The extent of this increase was related to soil type and land use.

Table 9. Nitrogen efflux from the paired developed (cropped or pasture) and undeveloped sites.

N-Form	Year	Mineral Soil Crop	Mineral Soil Natural	Shallow Organic Crop	Shallow Organic Natural	Deep Organic Pasture	Deep Organic Natural
		kg/ha					
NO_3-N	1976*	0.1	0.5	0.3	0.0	0.3	0.0
	1977	1.6	0.3	0.8	0.3	0.7	0.2
	1978	4.3	0.3	2.8	0.3	0.9	0.1
	1979*	6.3	0.1	0.6	0.0	0.2	0.0
	Average**	4.1	0.4	1.8	0.2	0.7	0.1
NH_4-N	1976*	0.1	0.1	0.8	0.2	0.3	0.1
	1977	1.4	0.4	0.8	0.5	1.5	0.5
	1978	4.2	1.0	2.7	1.4	1.6	0.6
	1979*	5.4	0.3	0.7	0.5	0.6	0.5
	Average**	3.7	0.6	1.6	0.9	1.3	0.6
TKN	1976*	1.1	1.0	6.0	2.2	1.3	1.0
	1977	5.7	2.1	14.5	5.4	7.0	5.4
	1978	15.2	4.3	13.1	5.5	6.2	6.9
	1979*	11.5	2.3	9.9	3.5	3.9	4.3
	Average**	11.2	3.2	14.5	5.5	6.1	5.8
Total N	1976*	1.2	1.5	6.3	2.2	1.6	1.0
	1977	7.3	2.4	15.3	5.7	7.7	5.6
	1978	19.5	4.6	15.9	5.8	7.1	7.0
	1979*	17.8	2.4	10.5	3.5	4.1	4.3
	Average**	15.2	3.6	16.0	5.7	6.8	6.0

*Measurement period in 1976 was for last six months of year and in 1979 for first six months of year.

**Average is for three calendar years starting in July of 1976 and is in kg/ha/yr.

Table 10. Weighted average concentration of nitrogen in drainage waters from the paired developed and undeveloped sites.

N-Form	Year	Mineral Soil Crop	Mineral Soil Natural	Shallow Organic Crop	Shallow Organic Natural	Deep Organic Pasture	Deep Organic Natural
		mg/l					
NO_3-N	1976*	0.05	0.58	0.12	0.02	0.44	0.01
	1977	0.60	0.15	0.11	0.06	0.20	0.05
	1978	0.76	0.06	0.50	0.07	0.22	0.02
	1979*	2.20	0.03	0.44	0.01	0.11	0.01
	Average**	1.00	0.11	0.29	0.05	0.21	0.03
NH_4-N	1976*	0.13	0.11	0.31	0.10	0.35	0.09
	1977	0.52	0.17	0.12	0.10	0.42	0.10
	1978	0.72	0.18	0.45	0.24	0.42	0.10
	1979*	1.86	0.10	0.25	0.14	0.24	0.15
	Average**	0.91	0.15	0.28	0.16	0.37	0.11
TKN	1976*	1.23	1.14	2.25	1.07	1.68	1.21
	1977	2.14	0.86	2.03	1.00	1.78	1.17
	1978	2.63	0.81	2.28	0.96	1.62	1.08
	1979*	3.98	0.74	3.14	1.08	1.63	1.25
	Average**	2.73	0.82	2.36	1.02	1.67	1.15
Total N	1976*	1.28	1.72	2.37	1.09	2.12	1.22
	1977	2.74	1.01	2.14	1.06	1.98	1.22
	1978	3.39	0.87	2.78	1.03	1.84	1.10
	1979*	6.18	0.77	3.58	1.09	1.74	1.26
	Average**	3.73	0.93	2.65	1.07	1.88	1.18

*Measurement period in 1976 was for last six months of year and in 1979 for first six months of year. The mineral soil was not cleared and cropped until 1977, so both sites on this soil were in trees in 1976.

**Average is for three years starting in July 1976.

Because of its immediate availability to organisms living in the water, inorganic nitrogen is of the most concern. The increase in this form of nitrogen upon development was very small. The average increase in NO_3-N + NH_4-N ranged from 1.3 kg/ha/yr on the deep organic soil used for pasture to 6.8 kg/ha/yr on the mineral soil used for row crops. The average increase on mineral soils may be somewhat greater than we measured in this study because soybeans were grown two of the three crop years and nitrogen-fertilized corn is normally grown every other year. However, the increase is still small compared to inorganic nitrogen flux from other cultivated soils in North Carolina and elsewhere. Gilliam et al. (1978) measured 30-40 kg/ha/yr of NO_3-N leaving cultivated upland soils in North Carolina. The amount of NO_3-N leaving the organic soils in North Carolina is also much less than that measured for organic soils in Florida (Hortenstine and Forbes, 1972) and New York (Duxbury and Peverly, 1978). For example, the New York soils lost 40-90 kg/ha/yr of NO_3-N to drainage waters. The differences between the drainage characeristics of the organic soils in the different locations is the main reason for the large difference in nitrogen concentration. North Carolina organic soils are very poorly drained, even with improved drainage, so nitrate is readily lost through denitrification during wet periods. Also there is a significant difference between the C/N ratio between North Carolina and New York and Florida organics (Dolman and Buol, 1967) with the result that more nitrogen is mineralized in the New York and Florida organic soils.

The average concentration of inorganic nitrogen leaving the developed soils in this region is approximately the same as the concentration in the stream entering the region from further inland (cf. Fig. 23, Table 10 and Water Quality Records for North Carolina, U.S.G.S.). Thus, inorganic nitrogen contributions from developed organic and high organic mineral soils would not significantly affect the concentration in most receiving streams. Furthermore, such contributions would appear to be insignificant as compared to movement from other cultivated soils of North Carolina where the concentrations are frequently 15-25 mg NO_3-N/l and the current concentrations of nitrogen in the major streams of the area.

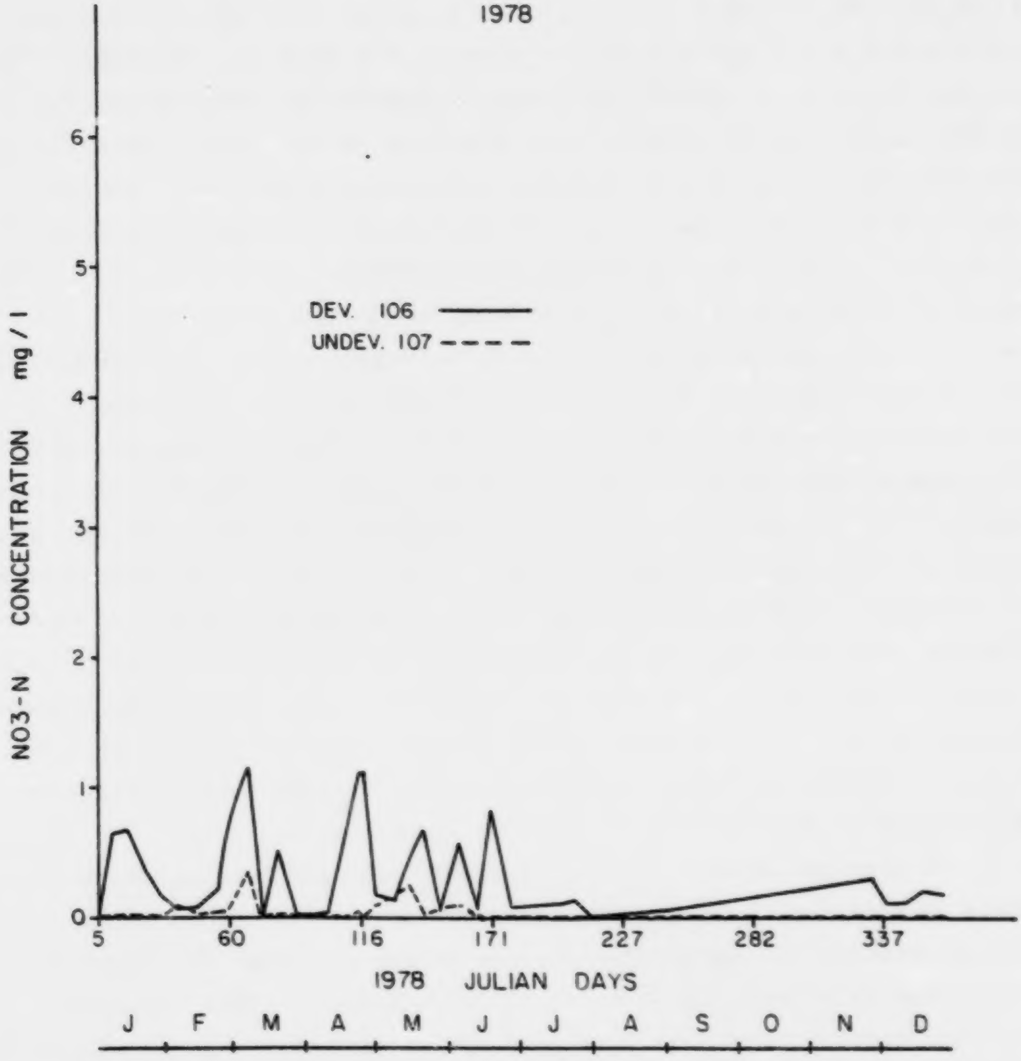


Figure 23. The influence of agricultural development on the concentration of nitrate nitrogen in drainage water leaving the shallow organic soil sites.

The increase in organic nitrogen leaving in drainage water, particularly from the cultivated soils, was much greater. However, this increase was only 8-10 kg/ha/yr and much of this nitrogen would be expected to settle out in the ditches before reaching the estuaries. This nitrogen is mostly present as particulate organic matter and is a part of the material which must be periodically removed from the major collector and drainage canals in the region to maintain their flow capacities. The total amount of this nitrogen which reached the major streams or estuaries would be inversely related to the distance that the water had to travel before reaching an outlet.

Phosphorus

The effects of agricultural development upon phosphorus efflux and concentration in the drainage waters is shown in Table 11. There was a relatively large increase in phosphorus in drainage waters from developed organic soils. The developed mineral soil lost much less phosphorus than the two developed organic soils (Fig. 24). Actually the developed mineral soil lost only slightly more phosphorus to drainage water than the undeveloped organic soils (Table 11).

Most of the phosphorus lost from the organic soils is not associated with the sediment but is in solution as orthophosphate. When we first noted the relatively high concentrations from the developed shallow and deep organic sites, we analyzed 88 different samples for both orthophosphate and total phosphorus (Appendix Table F). The phosphorus leaving the developed deep organic site and the shallow organic site was 87% and 50% orthophosphate, respectively. The loss of inorganic phosphorus from the organic soils is easily explained. For satisfactory corn production on these soils, addition of phosphorus fertilizer is required (Daughtrey et al., 1973). However, organic matter in soils does not react with phosphorus unless there is sufficient mineral matter to provide aluminum for the cation exchange sites on the organic matter (Fox and Kamprath, 1971). Thus phosphorus remains in solution in organic soils and significant quantities of phosphorus can be lost to water moving through or on the soils.

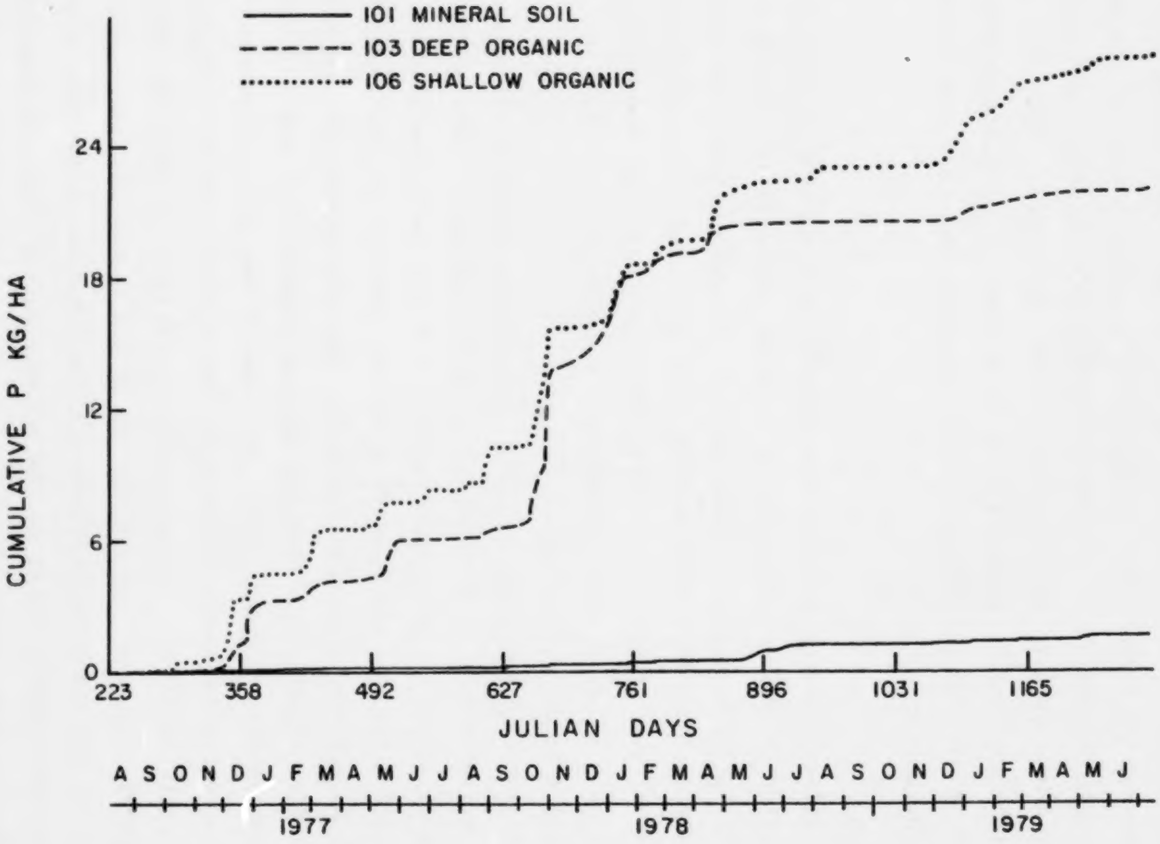


Figure 24. The effect of soil type on the quantities of phosphorus in drainage waters from the three developed sites.

Table 11. Phosphorus efflux and weighted average concentration from the paired developed (cropped or pasture) and undeveloped sites.

Site No.	Soil Description	1976*		1977		1978		1979*		Average**	
		Flux kg/ha	Conc mg/l	Flux kg/ha	Conc mg/l	Flux kg/ha	Conc mg/l	Flux kg/ha	Conc mg/l	Efflux kg/ha/yr	Conc mg/l
101	Crop Mineral	0.07	0.06	0.22	0.08	1.01	0.17	0.35	0.13	0.56	0.14
102	Nat. Mineral	0.10	0.13	0.17	0.07	0.25	0.05	0.04	0.01	0.20	0.05
106	Crop Shallow Organic	3.58	1.33	12.53	1.75	5.13	0.87	1.52	0.49	7.64	1.21
107	Nat. Shallow Organic	0.05	0.02	0.31	0.06	0.19	0.03	0.07	0.03	0.21	0.04
103	Pasture Deep Organic	1.85	2.27	12.44	3.22	8.70	2.23	4.08	1.73	9.54	2.48
104	Nat. Deep Organic	0.05	0.05	0.53	0.10	0.33	0.05	0.13	0.04	0.35	0.06

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* Measurement period in 1976 was for last six months of year and in 1979 for first six months of year. Site 101 was not cleared until 1977, so flux in 1976 is for a natural area.

** Average is for a three-year period starting in July 1976.

The quantities of phosphorus lost from developed soils in this region would be expected to be directly related to the organic matter content and depth from the soil surface to the mineral contact. In this study, approximately the same quantities from the shallow and deep developed organic soils were measured, but the deep organic site received less phosphorus fertilizer during the study and also had less total runoff water due to less rainfall at this site. The average concentration was greater from the deep organic than from the shallow organic. The developed mineral soil with the histic epipedon (surface organic layer < 40 cm) lost less than 10% of the amount of phosphorus lost by the organic soils.

The amounts of phosphorus found leaving in drainage waters from cultivated mineral soils in this study are very similar to values obtained from other mineral soils in North Carolina (Gilliam et al., 1978). The values obtained for organic soils are similar to those measured from organic soils in Florida (Hortenstine et al., 1972) and New York (Duxbury and Peverly, 1978). The poor drainage and reducing conditions in the North Carolina organic soils have no influence upon the phosphorus losses in contrast to the effect that these conditions have upon nitrate losses.

An accurate assessment of the effect that continued clearing and development in the Blacklands area will have upon the quantities of phosphorus reaching drainage outlets cannot be made. There is no question that many fertilized organic soils will lose high amounts of phosphorus. However, the true organic soils are not nearly as agriculturally productive under existing technology as mineral soils. As a result, current agricultural development places heavy emphasis on mineral soils (organic layer < 40 cm thick). Other factors which will influence the quantity of phosphorus reaching outlets is the distance between the field and drainage outlet and the type of sediment or ditch bank between the field and outlet. Mineral sediments in ditches or mineral ditch banks would readily react with the orthophosphate and remove much of it from solution.

Sediment and Sediment Associated Parameters

Because these areas have such a small amount of relief, soil erosion is not an agricultural problem except for having to remove sediment from ditches. However, any time that water flows across a soil area which does not have a plant cover, the water will move more soil particles than water moving over a similar soil with a plant cover. This is illustrated by the data given in Table 12 showing sediment (particles with > 0.45 µm diameter) losses. Although the losses were significantly increased upon development for agricultural use, they were very small compared to losses from most other soils. It should be remembered that most erosion losses are measured in tons per hectare and the units used in Table 12 are kg/ha. In fact, the total organic carbon (TOC) losses were higher in the deep organic soil than sediment losses. In two of the three years, total organic carbon was also higher on the developed shallow organic site, but a period of intense land forming and buried wood removal in 1979 caused considerable sediment loss from this site. We were initially surprised by TOC losses being greater than sediment losses, but the strong tea color of the water at all times, even after filtering, indicated that our values were appropriate.

Table 12. Average sediment, organic carbon, and turbidity measured in the drainage water from the developed and undeveloped sites.

Site	Soil	Use	Sediment* kg/ha/yr	Total Organic Carbon** kg/ha/yr	Turbidity* J.T.U.
101	Mineral	Crop	316	103	92
102	Mineral	Natural	87	94	26
106	Shallow Organic	Crop	592	387	61
107	Shallow Organic	Natural	55	219	14
103	Deep Organic	Pasture	59	165	56
104	Deep Organic	Natural	37	263	11

*Average for three years.

**Average for two years.

The effect of man's activity on sediment losses is illustrated in Fig. 25 showing sediment losses from the developed and natural shallow organic sites. The large increase in sediment losses in February 1977 on the developed site is a result of a ditch cleaning operation. The much larger increase during the winter and spring of 1979 is a result of extensive land forming and buried wood removal.

The turbidity of the drainage water from the developed sites was nearly always higher than from the corresponding undeveloped sites. The turbidity was also greatly influenced by the activity which was occurring on the land. The highest values measured were during the land clearing and field shaping operations on the mineral site in 1977. A significant increase in turbidity in runoff water during the first 2-3 rainfall events after spring planting was measured.

The quantity of sediment leaving these soil types as a result of development is not likely to be a problem. There have been reports of complaints of turbidity of drainage waters during land clearing operations, but the turbidity is much lower once the land is formed for proper drainage.

Dissolved Oxygen and Biological Oxygen Demand

The slow moving, organic rich natural streams in the Blackland soils region are well known for their low oxygen contents, particularly during periods of low flow (Kuenzler et al., 1977). That was also evident in this study, particularly in the drainage water from the deep organic soils (Table 13). There was very little difference in dissolved oxygen between the developed and undeveloped sites although the developed sites averaged 1-2 mg/l higher dissolved oxygen. This is consistent with observations for channelized streams (Kuenzler et al., 1977) as compared to natural streams and probably results from more turbulence due to faster water flow. At most sampling times, the dissolved oxygen was very similar within each pair of developed sites, however, when the values were high, the peaks tended to be higher on the developed sites. This is illustrated in Fig. 26 for the shallow organic soil sites. The peaks corresponded to relatively high flow periods when flow rates were greater from the developed sites.

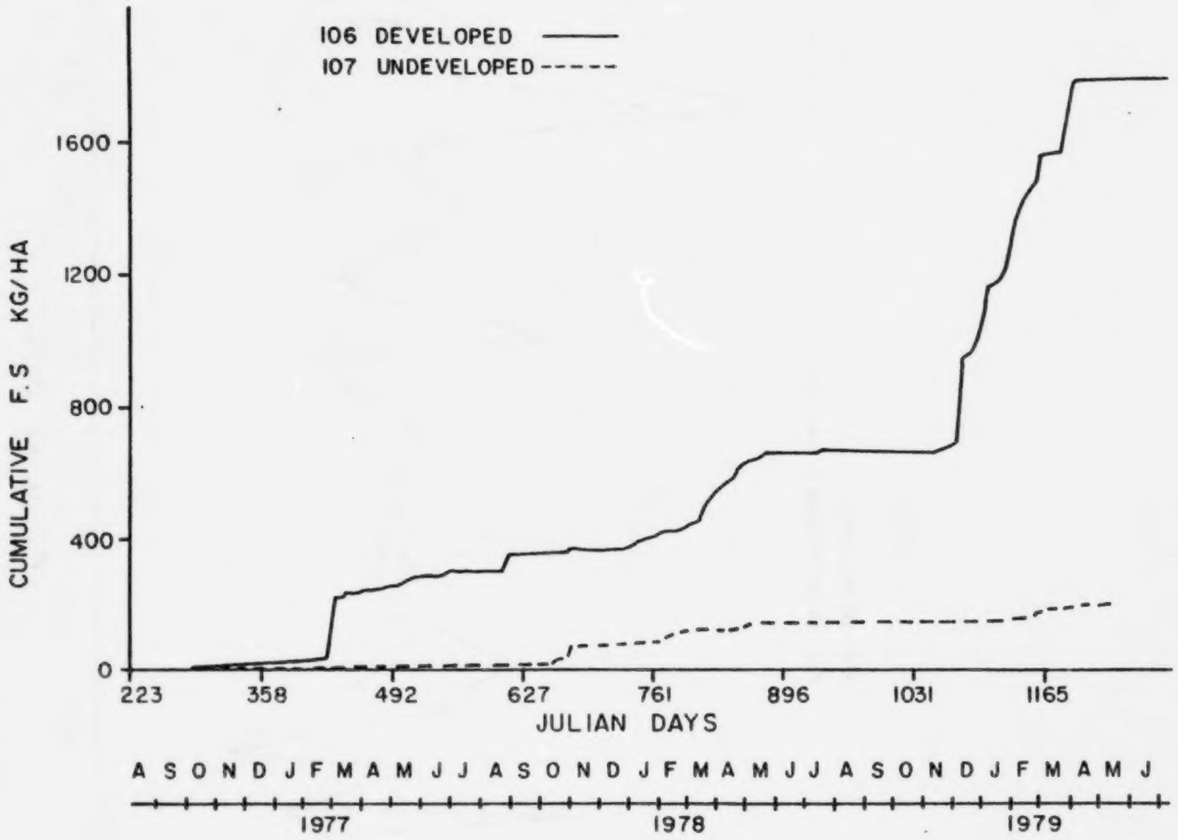

Figure 25. The effect of development on filterable solids in drainage waters from the shallow organic soil sites.

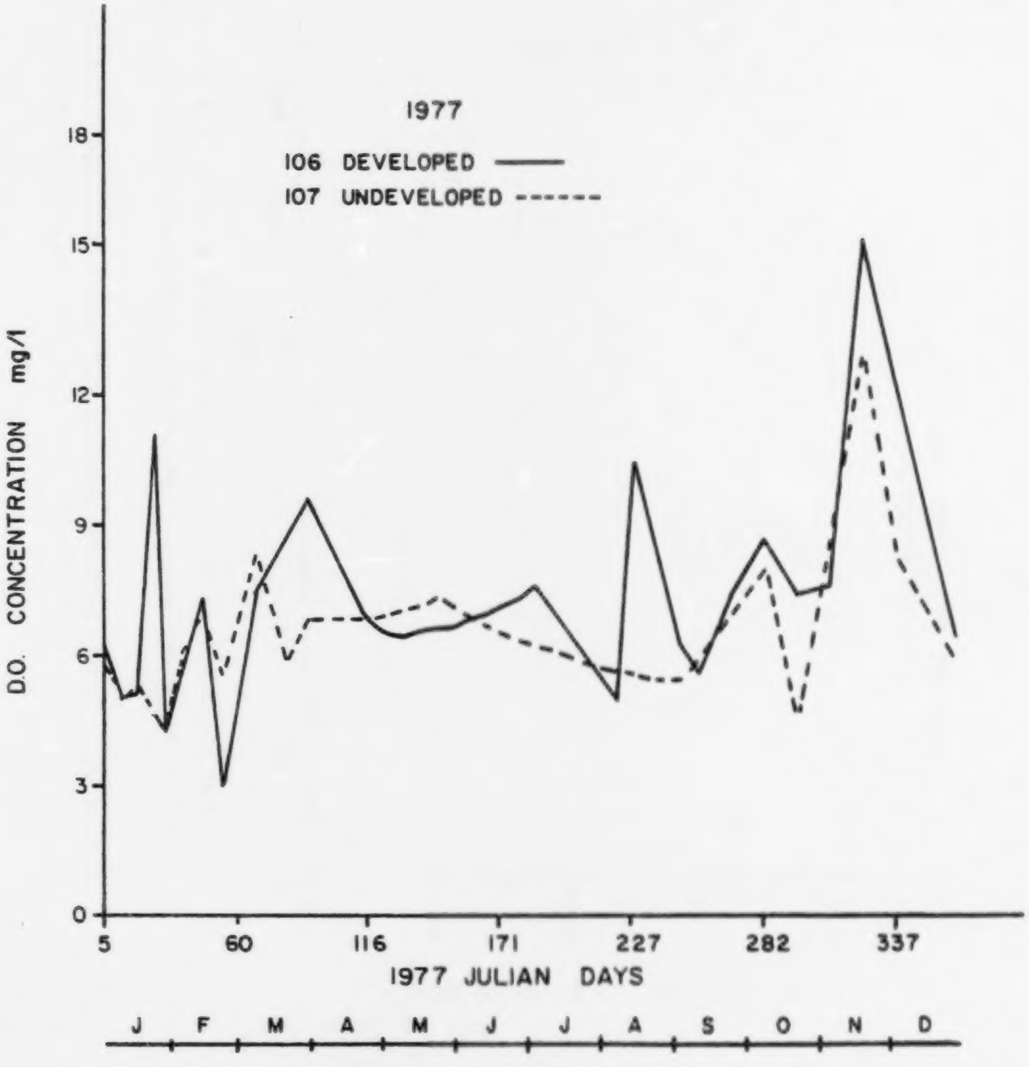

Figure 26. Dissolved oxygen in drainage waters from the shallow organic soil sites.

Table 13. Weighted average dissolved oxygen and biological oxygen demand for the drainage waters from the developed and undeveloped sites.

Site No.	Use	1976 D.O.	1976 B.O.D.	1977 D.O.	1977 B.O.D.	1978 D.O.	1978 B.O.D.	1979 D.O.	1979 B.O.D.
		mg/l							
101	Crop	5.1	3.2	8.1	4.1	9.3	7.5	7.4	3.8
102	Natural	7.2	2.2	7.4	2.8	8.0	2.7	8.4	2.3
106	Crop	8.2	2.7	7.2	4.1	7.2	4.1	7.3	3.0
107	Natural	5.2	2.0	6.6	1.6	6.5	2.3	5.7	1.5
103	Pasture	3.1	3.5	3.3	3.5	4.2	3.1	4.3	2.7
104	Natural	3.4	2.1	5.7	2.3	6.0	2.0	6.1	1.8

The biological oxygen demand was relatively low for all sites when one considers the relatively high dissolved organic carbon present in the water. The organic matter in these soils tends to have a high C/N ratio and is much more resistant to microbial decomposition than the organic matter in most upland soils (Dolman and Buol, 1967). There was a significant increase in the biological oxygen demand in drainage water from the developed soils as compared to the undeveloped soils. This relationship in B.O.D. for cropped and natural areas was expected and has been observed before in New Jersey (Whipple et al., 1974). It is doubtful that this increase in B.O.D. from developed areas has any real water quality significance because of the high organic carbon content of drainage water from both developed and undeveloped land areas.

Temperature

All temperature measurements were made during the daylight, mostly in the afternoon, and thus do not represent the average temperature of the drainage waters. Because of this, the measurements tend to maximize differences between developed and undeveloped sites. The measurements within a site pair were made within an hour of each other, but there may have been several hours before measurements were made at another site pair.

There were only small differences between average temperatures in drainage waters from developed and undeveloped sites at two of the three locations (Table 14). The developed and undeveloped sites on the deep organic were very similar with the natural site actually being slightly higher. The similarity between temperatures of drainage water at these sites is probably a result of the poor vegetative growth at the natural site providing little shade for the canal. The ditches at the other two undeveloped sites would have been in the shade much of the day. The large average difference between the developed and undeveloped sites on the shallow organic soil results from the more frequent lack of flow in the undeveloped site during the summer when higher temperatures occurred. This can be seen in Fig. 27 where more data points are missing on the undeveloped site during the high temperature months.

Table 14. Yearly average of the temperature measurements on the drainage water from each site (°C).

	Mineral Soil		Shallow Organic		Deep Organic	
Year	Crop	Natural	Crop	Natural	Pasture	Natural
1976	15.7[*]	15.8[*]	17.7	17.7	17.1	19.0
1977	17.2	14.1	18.4	15.5	16.9	18.3
1978	15.9	17.5	17.4	12.5	17.0	16.2
1979	17.1	14.2	18.9	11.8	17.6	17.8
Mean	16.7	15.2	18.1	14.4	17.1	17.8

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[*] Since neither site on the mineral soil was developed in 1976, these numbers are not included in the average.

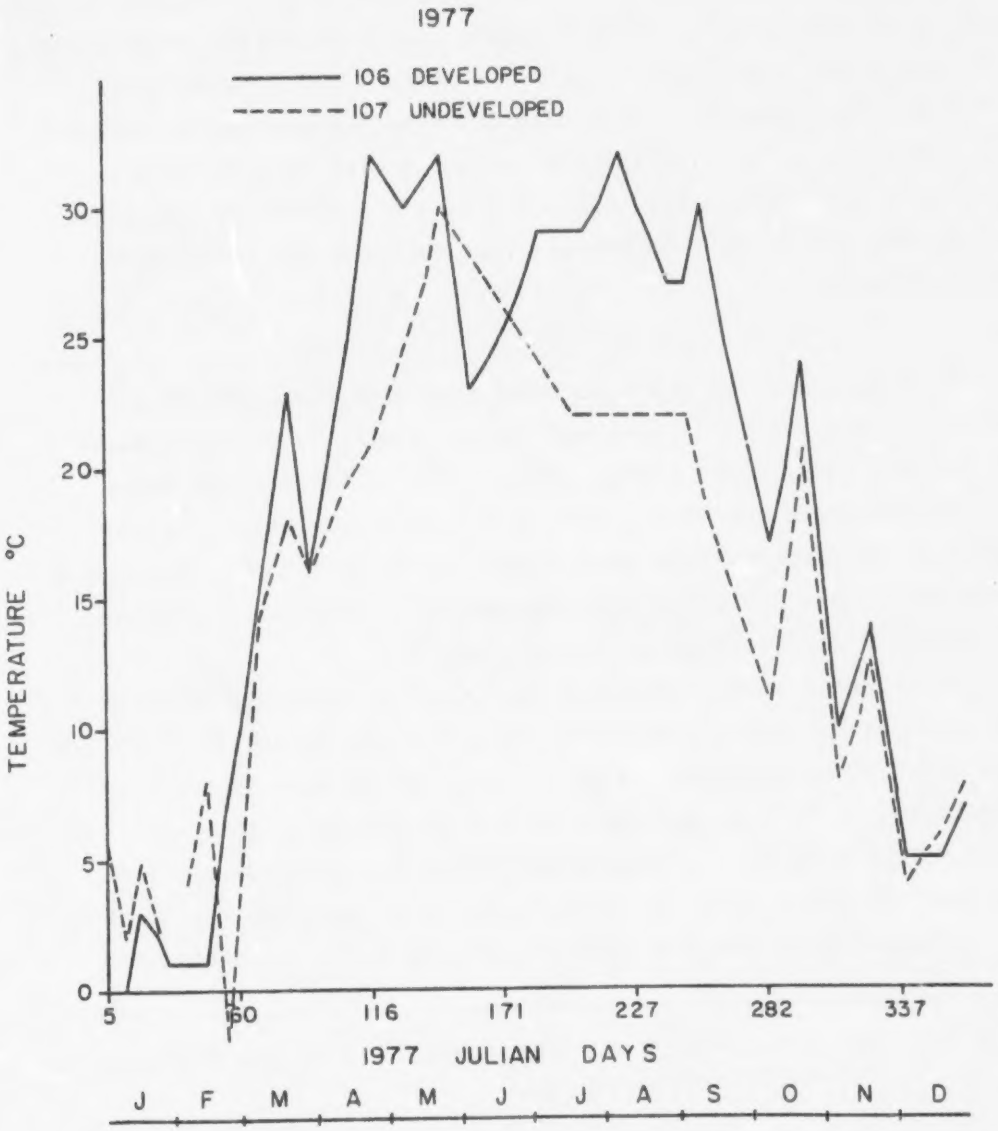

Figure 27. The effect of development on temperature of drainage waters from the shallow organic soil sites.

There is little doubt that the average temperature of the drainage water from cleared sites will be higher than from wooded sites. This also was observed by O'Rear (1975) for channelized streams. The practical significance of this difference in temperature is probably small since most of the difference occurs during very low flow periods in the summer (Fig. 27). It is also doubtful if one could follow this temperature difference very far from the field size drainage units.

pH

Drainage water in the Blacklands region of North Carolina is well known for its dark color and low pH (Heath, 1975; Kirby-Smith and Barber, 1979). The average pH's of the water from the three undeveloped areas were 3.84, 4.06, and 4.91 (Table 15). The two organic soil sites had the lower values. The pH for the undeveloped areas was remarkable consistent throughout the year as illustrated in Figure 28 for the shallow organic site.

Development always increased the pH of the drainage water by 1.5-2 pH units. This is expected since it is necessary to apply lime at a rate of approximately 13 metric tons per hectare immediately after clearing to have satisfactory crop production. This will usually increase the soil pH from approximately 3.8 to approximately 5.2. Lime must be added every two to three years to maintain the pH above 5. Drainage water from the undeveloped site is in contact with a

Table 15. The average pH of the drainage water from the developed and undeveloped sites.

	Mineral Soil		Shallow Organic		Deep Organic	
	Crop	Natural	Crop	Natural	Crop	Natural
1976	4.86[*]	5.63[*]	4.63	4.09	6.18	4.16
1977	5.59	4.85	5.39	3.92	5.50	3.65
1978	5.71	4.90	5.69	4.05	5.32	3.79
1979	6.28	4.99	5.54	4.18	5.07	3.79
Average	5.86	4.91	5.32	4.06	5.52	3.84

[*] Since this site was not cleared in 1976, the means for the mineral soil sites do not include 1976.

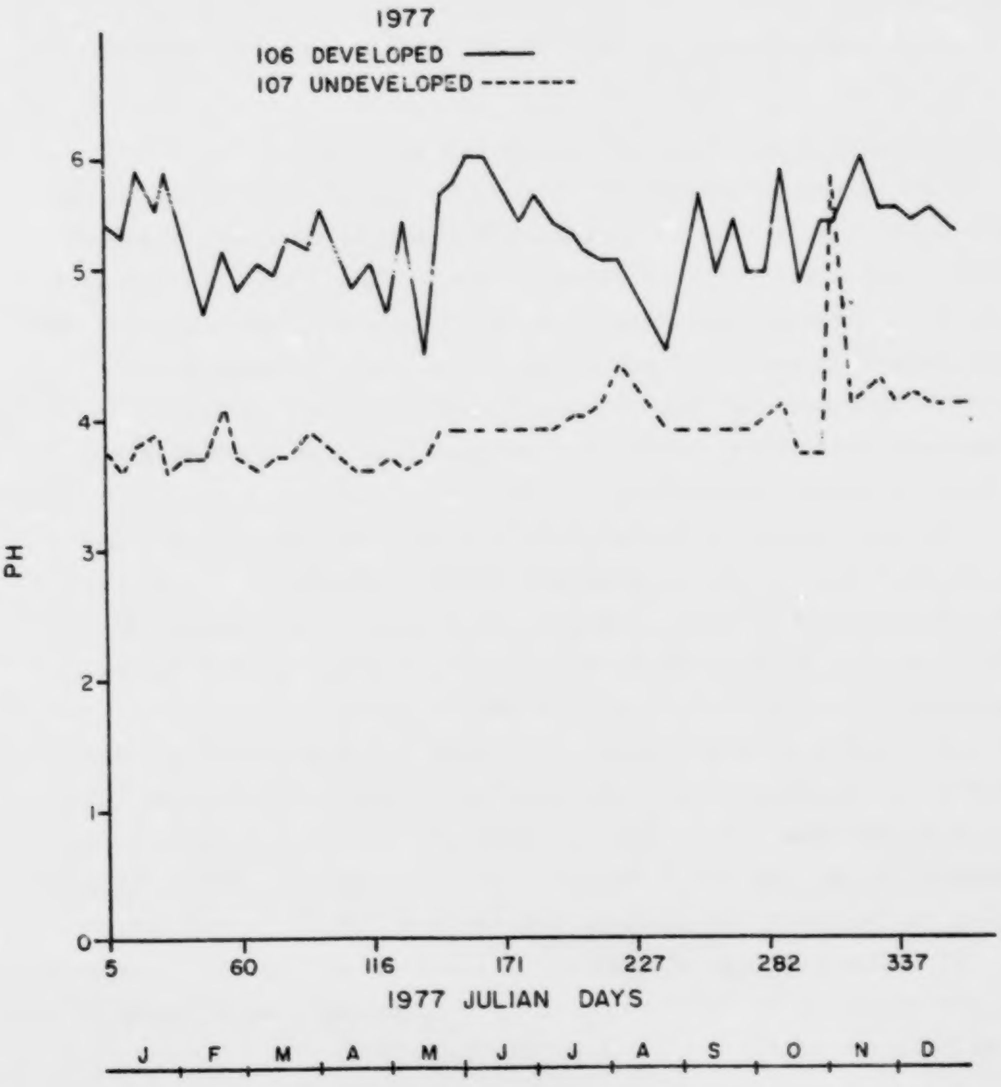

Figure 28. The effect of development on pH of drainage waters from the shallow organic soil sites.

well-buffered soil of pH 3.8 and drainage water from the developed site is in contact with an even better buffered soil of pH 5.2 so the difference in pH of the drainage water is no surprise. The biological significance, if any, of the pH change was not examined in this study.

Calcium, Magnesium, Potassium, Sodium, and Chlorine

None of these elements are generally considered critical in the evaluation of pollution of natural waters unless the concentrations become sufficiently high to cause a salt problem. They are normally present in adequate amounts for aquatic life and in humid regions only reach excess amounts in fresh waters in unusual circumstances. However, they must be studied to understand nutrient cycles of ecosystems and for the evaluation of changes when ecosystems are altered by man's activities.

The mean annual efflux of these elements and weighted average concentrations from the experimental sites are given in Table 16. The efflux of all of these elements was increased as a result of development. This is a consequence of all elements except Na being intentionally added to the develped sites in fertilizer or lime. In the undeveloped or natural sites, the concentration of all of these elements in drainage water from a particular site tended to be very constant over time. This was also true for Ca, Mg, and Na from the developed sites, but the K and Cl concentrations were considerably higher in the first few rainfall events after spring fertilization.

It is interesting to compare the losses from this highly organic wetland ecosystem to those measured by Bormann and Likens (1970) in an upland woodland ecosystem in New Hampshire.

	New Hampshire (approx.) kg/ha	North Carolina* kg/ha
Ca	13	14
Mg	3	6
K	2	2
Na	7	27

*Average of the three undeveloped sites.

Table 16. Mean annual efflux and weighted average concentration of Ca, Mg, K, Na, and Cl from the developed and undeveloped sites.

	Mineral Soil				Shallow Organic				Deep Organic			
	Crop		Natural		Crop		Natural		Pasture		Natural	
	Conc.	Flux*	Conc.	Flux	Conc.	Flux	Conc.	Flux	Conc.	Flux	Conc.	Flux
	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha
Ca	12.9	53.3	2.8	11.4	16.9	106.5	5.1	27.7	10.4	40.0	1.4	7.6
Mg	3.1	12.8	1.7	6.8	2.7	17.0	1.9	10.4	2.5	9.4	0.5	2.9
K	2.7	11.1	0.6	2.4	1.7	10.9	0.6	3.1	1.1	4.1	0.5	2.8
Na	13.4	55.2	7.3	29.6	7.7	48.3	6.0	32.6	5.1	19.7	3.7	20.1
Cl	16.7	69.0	8.2	33.3	13.0	82.2	8.2	44.5	9.2	35.3	2.2	12.0

* Effluxes are an average of three years starting July 1976.

Table 17. Mean annual efflux and weighted average concentration of copper, manganese, iron, zinc, and cadmium from the developed and undeveloped sites.

	Mineral Soil				Shallow Organic				Deep Organic			
	Crop		Natural		Crop		Natural		Pasture		Natural	
	Conc.	Flux	Conc.	Flux	Conc.	Flux	Conc.	Flux	Conc.	Flux	Conc.	Flux
	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha	mg/l	kg/ha
Cu	.013	.06	.008	.03	.022	.14	.011	.06	.009	.03	.012	.07
Mn	.026	.10	.024	.10	.019	.12	.011	.06	.027	.10	.003	.02
Fe	5.2	21.4	5.29	21.37	3.00	18.9	.83	4.5	1.66	6.4	.63	3.4
Zn	.07	.28	.02	.09	.05	.29	.02	.10	.02	.08	.01	.08
Cd	0**	0	0	0	0	0	0	0	0	0	0	0

* Efflux is three years average starting in July 1976.

** Measured concentrations was < 0.01 mg/1.

Calcium and potassium losses are very close even though the extremely acid organic soils in North Carolina are considered generally infertile. The greater losses of Mg from the organic soils is consistent with the knowledge that the organic soils are relatively rich in Mg and calcitic limestone ($CaCO_3$) is as effective for crop production as dolomitic limestone (mixture of $CaCO_3$ and $MgCO_3$) thus indicating that these soils contain sufficient Mg for crop growth. The much greater loss of Na from North Carolina soils is due to the much greater addition in rainfall because of its proximity to the ocean. The considerably lower loss of Na and Cl from the natural deep organic site, as compared to the other two natural areas, is likely a result of the distance to salt water from this site being approximately twice the distance to salt water as the other two natural sites.

Copper, Manganese, Iron, Zinc, and Cadmium

The interest in heavy metal contamination of natural ecosystems in recent years raises the question as to the effect of agricultural development upon losses of the above metals. Horvath et al. (1972) found that the highest concentration of dissolved metals in a Florida canal was adjacent to cultivated areas. The data in Table 17 (previous page) show that there was generally an increase in the export of Cu, Zn, Mn, and Fe from the cultivated areas as compared to the natural areas. The effect of development from pasture was essentially nil. Most of the measured increase is believed to be a result of the increase in sediment loss and the elements are believed to be associated with the sediment. Our analytical procedure was a total elemental analysis for these elements. Even though there was a slight increase, the solution concentration of these elements was low and never approached toxic or problem levels.

The iron concentration in drainage water from both the developed and undeveloped inorganic soil sites was interesting because it frequently turned the water reddish-brown as it was oxidized from the ferrous to the ferric form and formed a precipitate.

The levels of cadmium were below our accurate measurement limits of 0.01 mg/l. Although the transport of Cd is probably greater than zero, the levels were extremely low from both developed and natural sites.

Conductivity

Since there was an increase in total solids, chlorine and several cations, it follows that an increase in conductivity would be a result of development. This increase was very seasonal as illustrated in Figure 29 for the shallow organic soil site in 1977. The conductivity was higher in the late spring and summer. This is probably a result of two factors. Sediment losses were greater during this period because of soil disturbance and the addition of fertilizer during the spring planting. Potassium is present in fertilizers as KCl and effects of the Cl addition on Cl losses has already been shown in Table 16. The close correlation between conductivity and Cl concentration is shown in Fig. 29. The increase in conductivity probably has little environmental significance.

Fecal and Total Coliform Bacteria

The average numbers of fecal and total coliform bacteria in drainage water for 2.5 years is shown in Table 18. It is clearly evident from data in this table that development had a large effect upon the numbers of these bacteria present in the drainage water. The averages are very much affected by a few very high values, but as seen in Figs. 30-33, high counts were not uncommon in drainage water from the developed watersheds.

The increased number of bacteria from the grazed area was expected and a slight increase in the number from the cultivated fields was also anticipated. However, the magnitude of the increase from the cultivated fields was a surprise. These fields received no waste from domestic animals although the deer population in the area is high and an occasional bear track was noted, as well as occasional high numbers of ducks, geese and swans in the winter. However, it is not likely that this wildlife consistently provided high numbers of bacteria to the drainage water from the cultivated fields. It is much more likely that these counts are from bacteria

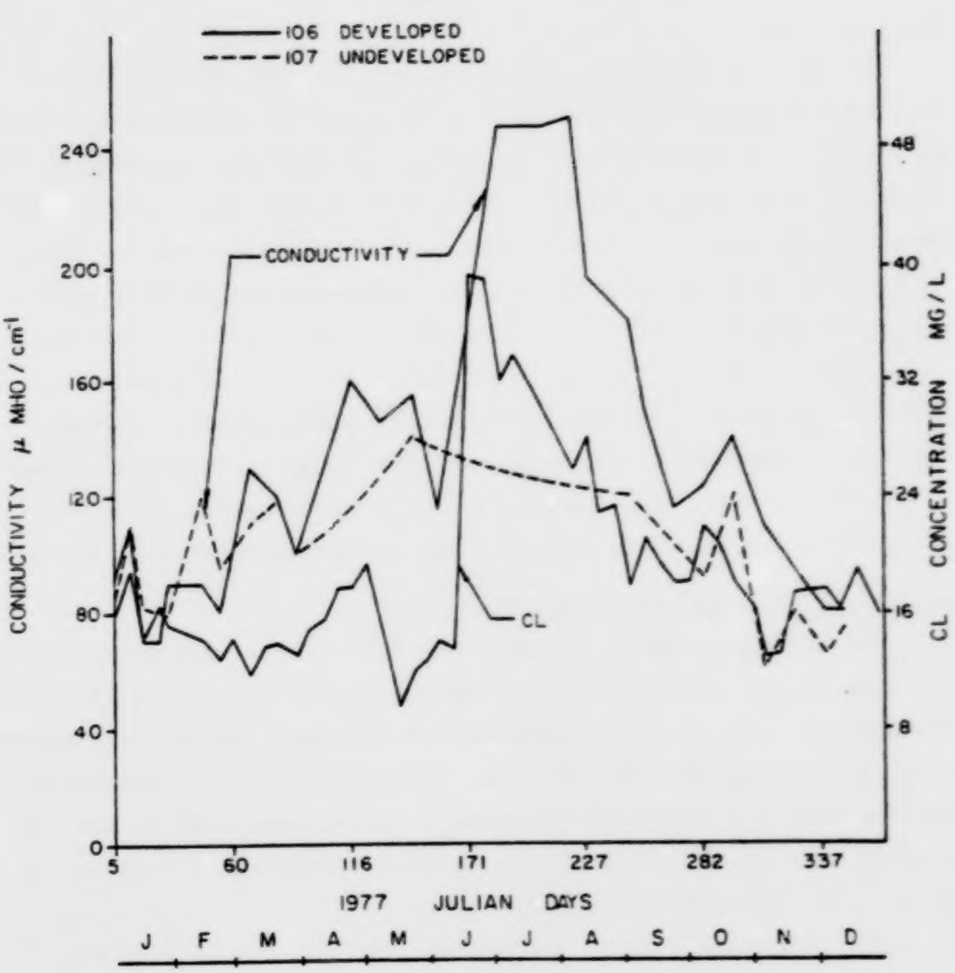

Figure 29. The effect of development on conductivity of drainage water from the shallow organic soil sites and the close correlation with Cl concentration.

which are able to live and multiply in these organic soils. Young and Greenfield (1923) have reported that coliform bacteria can survive up to three years in some soils. Tate (1978) noted that Escherichia Coli were able to survive much better in Florida organic soils than in sand or mineral soils. The increased survival and reproduction in the organic soil was believed to be a result of the increase in organic matter. Also anaerobic conditions promoted survival of the organism. It is probable that these conditions also promote survival and growth of these non-pathological bacteria in the organic soils of North Carolina. The difference between the natural or undeveloped sites is probably a result of the higher pH in the drainage waters because of liming. Acid environments are generally considered to be unfavorable for the survival of fecal organisms.

Although there was an increase in coliform bacteria from non-domestic animals on the sites developed for crop production, the increase from the grazed pasture site was much greater. This apparently is an inescapable consequence of animal production. Robbins (1978) in a review article on the environmental impact of unconfined animal production, summarized data from across the U.S. which showed that grazing cattle and sheep significantly increased the total and fecal coliform counts in streams draining grazed areas. This increase is not known to have caused health problems, partially because the increase in stream concentration is usually short-lived with marked reduction within 5 km downstream.

Table 18. Average fecal and total coliform bacteria concentrations measured in drainage water from the organic soil sites.

	Shallow Organic				Deep Organic			
	Crop		Natural		Pasture		Natural	
	Fecal	Total	Fecal	Total	Fecal	Total	Fecal	Total
	No./100ml							
1976*	28	1665	29	441	730	2672	18	132
1977	207	1091	9	139	1242	2665	5	71
1978	193	2054	28	313	1181	2231	17	117

*Only monitored for last six months of year. The averages are not weighted averages, but are means of all values obtained, regardless of flow rate.

Runoff from these organic soils is largely surface runoff and it is possible that this surface water carries more organisms into the drainage ditches than drainage water from other soil types. When we first noted the high counts from the pasture area, this was our concern. However, there was a period of almost a year from the early winter of 1977 until the fall of 1978 when no cattle were present on the pasture. As can be seen in Figs. 30 and 31, this lack of presence of animals has little influence upon numbers of coliform bacteria in the drainage water.

The environmental significance of the measured increase in coliform bacteria is not readily apparent. There definitely is an increase upon development, but the increase in areas which did not have domestic animals approached the increase from the cattle grazed pasture. As pointed out by Kirby-Smith and Barber (1979), it is not the coliform bacteria themselves which are harmful; they are used only to indicate the possibility of presence of human pathogens. When the coliform bacteria are of animal origin, their significance is unknown. As also discussed by the above authors, pristine surface waters often have bacteria numbers which violate the SH classification of the State of North Carolina. Thus, the increase in number of coliform bacteria that was found in drainage waters from pastured sites is not a cause for alarm, but one of concern.

Intensive Sampling for Nutrient Losses

It has been observed previously in North Carolina (Gambrell et al., 1974) that a large percentage of the nutrients and sediment loss from cultivated fields may occur in the first rainfall event following planting and fertilization. Others have noted that N and P concentration in outflows from organic soils (Duxbury and Peverly, 1978) may be directly related to flow rate. Kuenzler et al. (1977) also noted that sediment concentration and P in channelized streams were higher during high flows. Since we wished to completely characterize the runoff from agriculturally developed areas as well as from undeveloped areas, we maintained an intensive

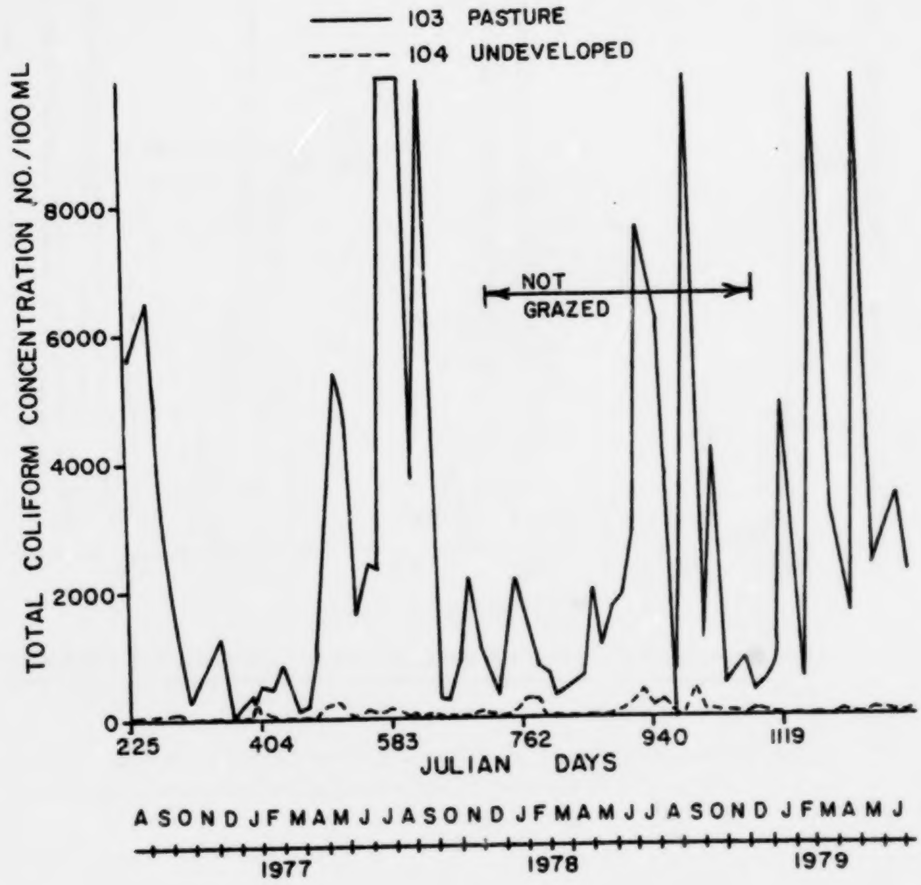

Figure 30. Total coliform bacteria in drainage water from the pastured and undeveloped deep organic soil sites.

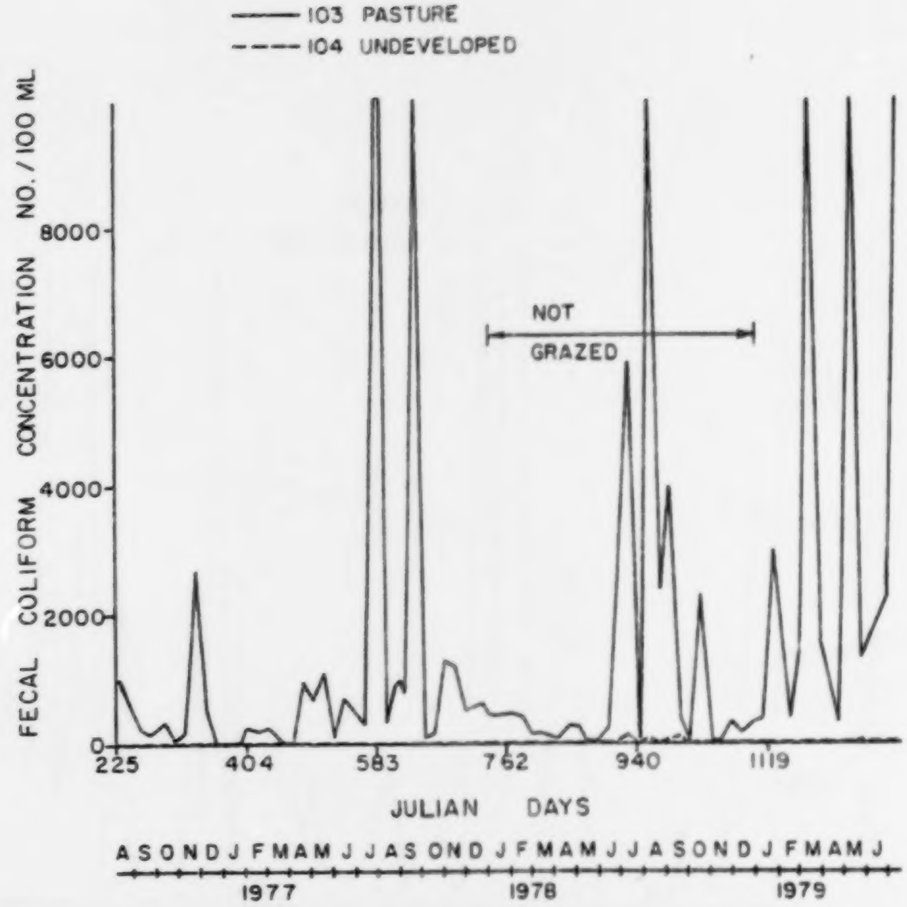

Figure 31. Fecal coliform bacteria in drainage water from the pastured and undeveloped deep organic soil sites.

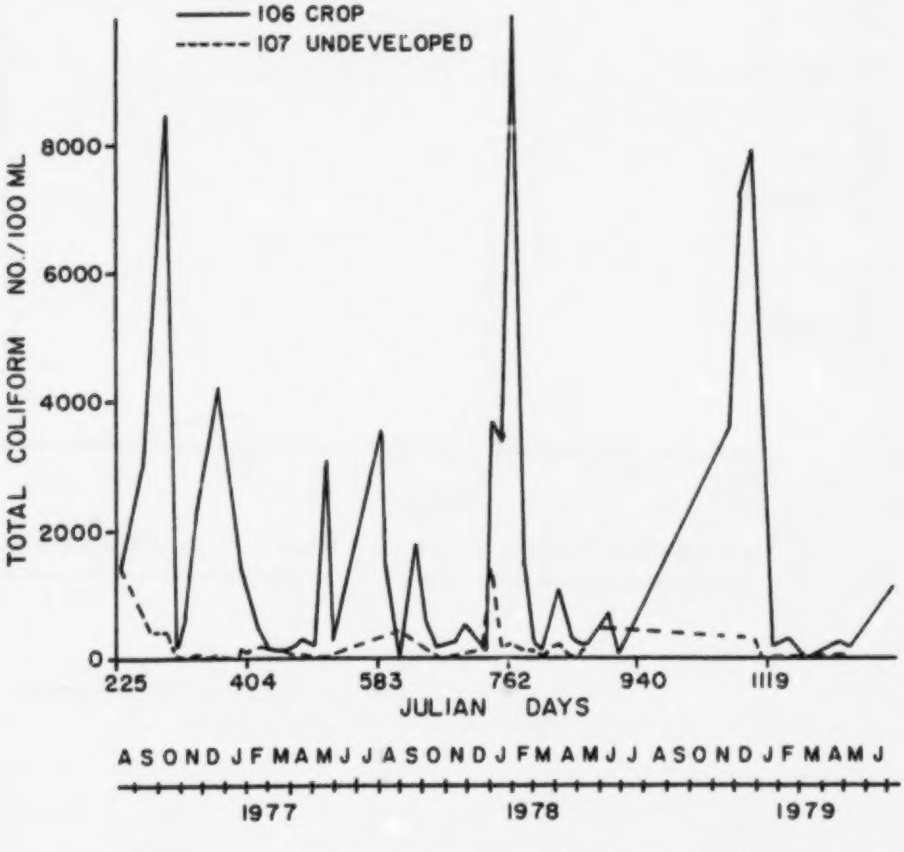

Figure 32. Total coliform bacteria in drainage water from the cropped and undeveloped shallow organic soil sites.

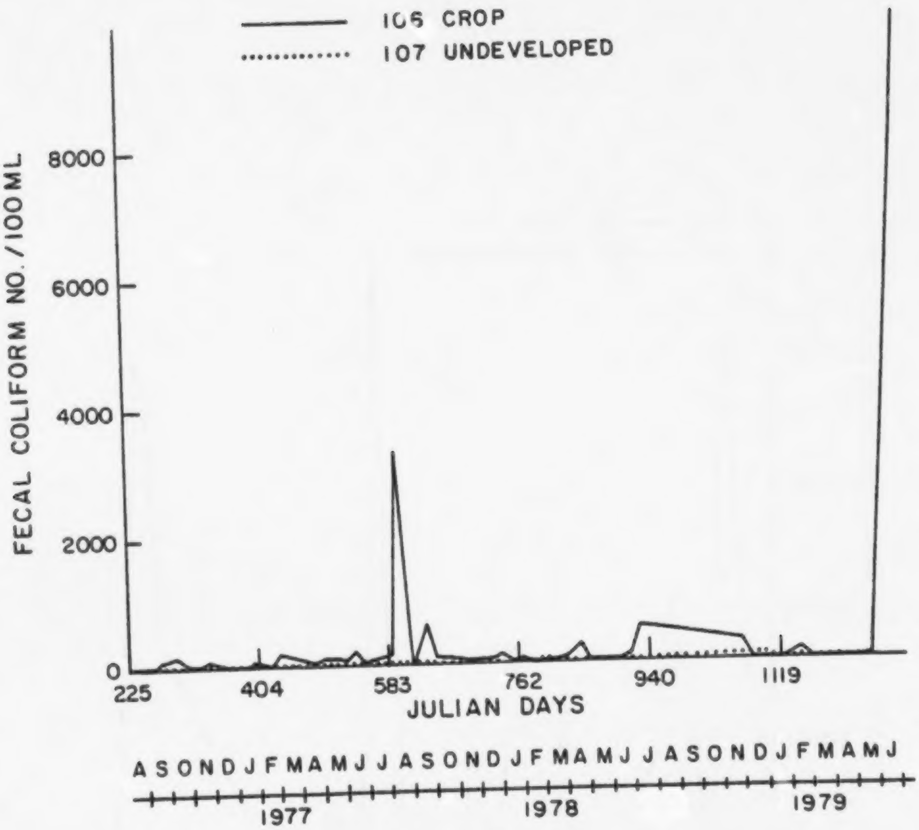

Figure 33. Fecal coliform bacteria in drainage water from the cropped and undeveloped shallow organic soil sites.

sampling program for 2-4 weeks following fertilization in 1977, 1978, and 1979. The intensive sampling program consisted of an individual being present during storm runoff events and taking discrete samples at several stages of the hydrographics opposed to automated composite sampling during the rest of the year.

Some of the results of this intensive sampling program for nutrients and sediments from the developed shallow organic site are given in Table 19. The data in this table indicate that we gained essentially no additional information by the intensive sampling program. The concentration did not increase dramatically and we had no rainfall event within a month of planting during 1977, 1978, or 1979 which produced large quantities of runoff. These organic soils can absorb a rather large amount of rain without runoff when they are relatively dry and this essentially happened each of the three years. Thus, the losses of nutrients and sediment were not much greater immediately following spring planting than during the rest of the year.

When an attempt was made to relate flow rate to concentration during the intensive sampling period and throughout the course of the study, P was the only element of those important for eutrophication which was significantly correlated to flow. This significant correlation only occurred at the pasture site. Even sediment was not correlated with flow rate. This is probably a result of inadequate drainage outlets which caused the stage to rise and the velocity in the ditches to be slow during the periods with highest outflows.

Elemental Deposition from Atmosphere and Accumulation or Loss from Natural Areas

The deposition measured in this study was the total amount deposited in our collector by dust and rainfall. Occasional samples were visually observed to be affected by vandals, birds, etc. These samples were discarded and the average of the composition of the rainfall events before and after the discarded samples was used to compute a concentration to be used for deposition calculations. Other samples were not visually observed to be erroneous but the data looked out of line. For example, when lime was being spread in the immediate area, both Ca and pH would be out of line even though that was what was deposited there. However, we decided

Table 19. Loss of water and nutrients during the intensive sampling period following spring planting and fertilization at the shallow organic soil site.

Rain		Date	Runoff				
Date	cm		H_2O cm	P kg/ha	NO_3-N kg/ha	TKN kg/ha	Solids kg/ha
1977							
Fertilized 6-21 Planted							
6-21 6-22 6-24 6-26	.50 7.03 .38 1.14	6-21 to 6-29	.03	.02	-0-	.01	.2
7-01 7-03	2.97 .55	6-29 to 7-6	.29	.11	.02	.11	2.62
1978							
Fertilized 7-01 Planted 7-01, 7-03							
7-03	.50	7-03 to 7-12	.01	---	---	---	.2
7-15 7-16	.12 1.01	7-12 to 7-18	.02	---	---	---	.1
7-18 7-20 7-24	1.78 2.79 3.17	7-18 to 7-25	.05	.001	---	.001	1.0
1979							
Fertilized 5-21 Planted 6-3							
5-26 5-29 6-02	1.22 .23 1.06	5-26 to 6-6	.27	.07	---	.16	5.5
6-11	1.14	6-6 to 6-11	.22	.03	---	.02	.5
6-17	[illegible]	6-12 to 6-19	.01	---	---	.01	.2

on the following procedure to correct for the obvious high values affected by known or unknown sources. The mean value for each element over all sites and years was computed. All samples were deleted which had:

(1) Two or more elemental concentrations which exceeded 10 times the mean value for that element

(2) Three or more elemental concentrations which exceeded 5 times the mean value of that element

(3) One elemental concentration greater than 10 times the mean plus 1 elemental concentration greater than 5 times the mean concentration

(4) If only one elemental concentration exceeded 10 times its mean concentration, this elemental analysis was deleted but the rest of sample analyses were used.

If man's activities in the immediate area had any influence upon the deposition measured, the effect would be expected to vary with site. Site 104 was several kilometers from a cultivated field and was approximately 1 km from an infrequently traveled road. Site 102 was at the edge of a cultivated field, but there were no other fields within 1 km. Site 106 was surrounded by several thousand hectares of cultivated land.

Deposition and Efflux of Nitrogen

The three year average deposition of nitrogen was very similar for the three sites (Table 20). There was considerable variation between years, however (Table 21). The amount of nitrate nitrogen was approximately the same as measured by Kuenzler et al. (1977) approximately 90 km west and slightly higher than measured by Gamble and Fisher (1966) in the same region. The NH_4-N was approximately 50% higher than measured by Kuenzler et al. (1977) and was 7-10 times as much as measured by Gamble and Fisher (1966). The biggest difference was in the organic nitrogen, however, where our values were 1.5-2 times the value of Kuenzler et al. (1977). The average total N deposited annually was 14-15 kg/ha.

The annual efflux of nitrogen in drainage waters from natural

Table 20. Average annual elemental deposition and efflux in the drainage water from the undeveloped sites.

	Site 102		Site 104		Site 106	
	Deposition kg/ha	Efflux kg/ha	Deposition kg/ha	Efflux kg/ha	Deposition kg/ha	Efflux kg/ha
NO_3-N	3.01	.4	2.97	.1	3.46	.2
NH_4-N	4.86	.6	4.56	.6	4.14	.9
TKN	11.19	3.2	10.74	5.8	12.10	5.5
Total N	14.20	3.6	13.71	6.0	15.56	5.7
P	.82	.20	1.24	.35	1.31	.21
Cl	19.65	33.3	15.11	12.0	30.39	44.5
Na	18.65	29.6	13.33	20.1	16.06	32.6
K	1.90	2.4	1.91	2.8	2.12	3.1
Ca	12.57	11.4	13.62	7.6	32.19	27.7
Mg	3.85	6.8	2.54	2.9	4.94	10.4
Cu	.15	.03	.11	.07	.17	.06
Fe	5.29	21.4	3.96	3.4	6.44	4.5
Mn	.09	.10	.09	.02	.08	.06
Zn	.34	.32	1.11	.08	.37	.10
pH	4.66	4.91	4.42	3.84	4.77	4.06

areas was 4-5 kg/ha. Because of the possibility of losses of nitrogen by volatilization, as well as deposition by bacterial nitrogen fixation, the net accumulation or loss of N cannot be computed from our data. One can say that the deposition does exceed the amount leaving the natural areas in drainage waters.

Phosphorus

The phosphorus concentration measured in the deposition was slightly higher than measured by others (Kuenzler et al, 1977; Hendry and Brezonik, 1976). The annual deposition was 0.8-1.3 kg/ha and efflux in drainage waters from the natural areas was approximately 20% of that deposited. Thus, these natural areas are accumulating P. These soil types tend to be deficient in P for plant growth and this deposition must be of some value for plants although the plant

Table 21. Elemental Deposition from Atmosphere.

SITE 101

	1976-77			1977-78			1978-79			3 Year Average		
	Total	Weighted Conc	Average Conc	Total	Weighted Conc	Average Conc	Total	Weighted Conc	Average Conc	Total	Weighted Conc	Average Conc
	kg/ha	mg/l	mg/l	kg/ha	mg/l	mg/l	kg/ha	mg/l	mg/l	kg/ha	mg/l	mg/l
pH*	---	4.46	5.20±.19	---	4.58	4.87±.10	---	5.09	5.26±.10	---	4.66	5.09±.07
NO_3-N	1.83	.19	.27±.07	2.88	.21	.29±.06	4.31	.32	.77±.06	3.01	.24	.28±.04
NH_4-N	3.43	.36	.66±.22	2.23	.16	.25±.05	8.93	.66	.81±.14	4.86	.40	.45±.08
TKN	10.90	1.14	1.38±.30	6.27	.45	.62±.11	16.42	1.22	1.05±.19	11.19	.91	.97±.11
Total N	12.73	1.33	1.65	9.15	.66	.91	20.73	1.54	1.32	14.20	1.15	1.25
P	1.22	.12	.15±.04	.51	.04	.05±.007	.74	.05	.05±.009	.82	.07	.07±.01
Cl	14.92	1.56	1.63±.22	21.02	1.52	1.54±.31	23.02	1.71	2.26±.48	19.65	1.60	1.84±.22
Na	8.19	.86	1.03±.26	26.40	1.91	2.27±.35	21.37	1.59	1.71±.23	18.65	1.52	1.75±.18
K	.59	.06	.07±.04	.41	.03	.04±.02	4.71	.35	137±.07	1.90	.15	.18±.03
Ca	8.07	.85	1.17±.30	14.79	1.07	1.30±.21	14.85	1.11	1.08±.16	12.57	1.02	1.18±.12
Mg	2.20	.23	.26±.05	4.85	.35	.43±.07	4.51	.33	.34±.06	3.85	.31	.35±.04
Cu	0.02	.002	.002±.001	.20	.01	.01 ---	.23	.01	.01 ---	.15	.01	.01± --
Fe	2.22	.23	.23±.10	5.48	.40	.50±.10	8.15	.61	.58±.16	5.29	.43	.47±.07
Mn	----	----	--- ---	.11	.008	.009 --	.15	.01	.01 ---	.09	.007	.007± --
Zn	.30	.03	.04±.02	.51	.04	.35±.004	.19	.01	.01 ---	.34	.03	.03 --
Cd	----	----	---- ---	----	----	---- ---	----	----	---- ---	----	----	---- --

SITE 104

	1976-77			1977-78			1978-79			3 Year Average		
	Total	Weighted Conc	Average Conc	Total	Weighted Conc	Average Conc	Total	Weighted Conc	Average Conc	Total	Weighted Conc	Average Conc
	kg/ha	mg/l	mg/l	kg/ha	mg/l	mg/l	kg/ha	mg/l	mg/l	kg/ha	mg/l	mg/l
pH*	----	4.13	4.86±.23	----	4.62	4.91±.23	----	4.56	4.82±.09	----	4.42	4.85±.09
NO_3-N	2.46	.25	.31±.05	4.58	.30	.32±.05	1.86	.15	.17±.02	2.97	.24	.25±.02
NH_4-N	4.60	.47	.56±.24	7.35	.49	.47±.20	1.74	.14	.15±.06	4.56	.36	.35±.09
TKN	9.77	1.00	1.21±.44	15.72	1.04	1.21±.35	6.72	.54	.64±.14	10.74	.86	.95±.17
Total N	12.23	1.25	1.52	20.30	1.34	1.53	8.58	.69	.81	13.71	1.10	1.20
P	1.62	.17	.21±.07	1.38	.09	.13±.04	.72	.06	.06±.01	1.24	.10	.12±.02
Cl	14.71	1.50	1.84±.26	21.71	1.44	1.89±.37	8.94	.72	.90±.21	15.11	1.22	1.43±.16
Na	8.62	.89	1.15±.42	18.30	1.21	1.16±.17	13.08	1.05	1.10±.09	13.33	1.01	1.13±.13
K	1.57	.16	.18±.10	2.13	.14	.28±.11	2.04	.16	.16±.03	1.91	.15	.19±.04
Ca	7.38	.76	1.44±.63	26.18	1.74	1.42±.27	7.31	.59	.62±.06	13.62	1.10	1.06±.20
Mg	1.78	.18	.25±.08	4.22	.28	.29±.08	1.61	.13	.14±.02	2.54	.20	.21±.03
Cu	.04	.005	.007±.003	.17	.01	.01 ---	.13	.01	.01 ---	.11	.009	.009±.001
Fe	3.10	.32	.27±.09	5.90	.40	.41±.12	2.86	.23	.22±.01	3.96	.32	.28±.04
Mn	.07	.007	.006±.002	.10	.007	.007 ---	.09	.008	.006±.001	.09	.007	.006±.001
Zn	.52	.05	.05±.02	2.55	.15	.08±.02	.26	.02	.01±---	1.11	.09	.04±.007
Cd	----	----	---- ---	----	----	---- ---	----	----	---- ---	----	----	---- ---

Table 21 (Cont'd)

SITE 106

pH*	----	4.75	5.32±.21	----	4.59	4.98±.14	----	5.51	4.98±.13	----	4.77	5.56±.12
NO$_3$-N	2.76	.29	.28±.05	4.52	.30	.36±.04	3.09	.30	.37±.04	3.46	.30	.34±.03
NH$_4$-N	3.01	.31	.27±.05	5.26	.34	.53±.12	4.13	.40	.53±.12	4.14	.35	.47±.08
TKN	9.10	.95	.86±.15	13.13	.86	1.33±.31	14.07	1.36	1.33±.31	12.20	1.03	1.45±.22
Total N	11.86	1.24	1.14	17.65	1.16	1.69	17.16	1.66	1.70	15.56	1.33	1.79 ---
P	1.25	.13	1.0 ±.03	.94	.06	.09±.02	1.73	.17	.09±.02	1.31	.11	.13±.02
Cl	23.65	2.46	2.83±.44	37.72	2.47	2.71±.33	29.82	2.89	2.71±.33	30.39	2.66	3.07±.33
Na	6.79	.70	1.04±.30	21.93	1.44	1.44±.16	19.46	1.89	1.45±.16	16.06	1.37	1.65±.16
K	1.86	.19	.26±.09	.17	.01	.03±.02	4.32	.42	.03±.02	2.12	.18	.24±.04
Ca	16.84	1.75	1.79±.51	20.64	1.35	1.45±.21	59.08	5.32	1.46±.21	32.19	2.74	3.41±.44
Mg	3.18	.33	.36±.07	4.74	.31	.30±.03	6.89	.69	.30±.03	4.94	.42	.52±.06
Cu	.05	.006	.008±.003	.21	.01	.02±.007	.24	.02	.01±.003	.17	.01	.02 ---
Fe	3.17	.33	.54±.18	7.43	.49	.51±.07	8.73	.85	.50±.07	6.44	.55	.69±.07
Mn	.01	.001	.002±.001	.11	.008	.007±.001	.13	.01	.01±.001	.08	.007	.009 --
Zn	.16	.02	.19±.004	.58	.04	.04±.005	.35	.03	.04±.005	.37	.03	.03
Cd	----	----	---- ---	----	----	--- ---	----	---	--- ---	----	----	--- ---

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*Average pH was computed by taking negative log of all H$^+$ concentration; weighted average took into account rainfall amounts.

availability of the deposited P is not known.

Sodium and Chlorine

The deposition of these elements tended to vary the most during the study. This is easily explained by proximity to the coast and variation in the nature of rainfall events. The values reported in Table 20 are similar to those observed by Gamble and Fisher (1966) in the early sixties. It would appear that there is a greater efflux in the drainage water than the amount deposited, but this may simply be an artifact of the particular years measured.

Calcium and Magnesium

Calcium is the one element whose deposition is most likely to be influenced by developmental activities in the immediate region. As mentioned earlier, these soils require large initial applications of lime and additions every 2-3 years thereafter. During application of lime, dust from the lime can be seen blowing from the field and it seems likely that some of it is deposited by rainfall at a later time. This effect can be seen by the large increase in Ca at 106 in the area of the greatest agricultural activity as compared to the other two sites, where the activity was less. Even at 104 which was considerably removed from agricultural activity, the amounts of Ca deposited was over twice that measured by Gamble and Fisher (1966) 15 years earlier. There was very little difference in the amount deposited and amounts in drainage waters from the natural areas, however.

The Mg concentration measured in depositions was very similar to those measured by Gamble and Fisher (1966). The effluxes in the drainage waters were greater than the deposition which is consistent with knowledge that these soils are relatively rich in Mg.

Copper, Iron, Manganese, and Zinc

The accuracy of deposition of these elements is not as good as the other elements because of the lower concentrations. Except for Fe, the amounts deposited by dry and wet deposition and the amount lost in drainage waters were very low. The amounts of Fe deposited from the atmosphere was somewhat surprising (4-6 kg/ha/yr).

The source of this deposition is not known. One might think that it was a result of developmental activity in the immediate region, but there was little difference between sites indicating that activity in immediately adjacent areas was not a factor.

pH

There is tremendous current interest in acid rain and its effects on plants, soils, and waters. It can be seen in Table 21 that the average pH of the atmospheric deposition was relatively low. The site farthest removed from agricultural activity had a weighted average pH of 4.42 and the other two sites had values of 4.66 and 4.77. These values may also be affected by the obvious addition of lime to the atmosphere in the region.

The average pH measured in the immediate area by Gamble and Fisher (1966) fifteen years earlier was 5.1 - 5.3. The values we obtained were significantly lower even with lime used in the area. It should be pointed out that Fisher (1968) indicated that pH was thought to be the least accurate measurement in the study of Gamble and Fisher (1966).

From a soil resource view, the current acidity of the rain is not a problem. For example, it would only take 24 kg/ha of limestone to neutralize the acidity of the rain at the site with the lowest pH and the average farmer in the region applies approximately 2000 kg/ha/yr to cultivated soils. However, the increased acidity of the rain could cause problems for plants if the trend continues.

Pesticides

Precision and Reliability of Analytical Methods

Samples of both water and soil were analyzed for residues of alachlor in batches of 12. Three of the 12 samples were water, soil, or filter paper from untreated areas. One of these was used as a control and the other two were fortified before extraction with a known amount of alachlor. The fortification solvent was allowed to dry before extraction. The fortified samples are referred to as recoveries, and the recovery percentages are reported at the bottom of applicable tables.

Recoveries from the organic soils were generally in an acceptable range for pesticide residues in environmental samples. During the conduct of the study, the analytical procedure for alachlor residues in soils was modified (see PROCEDURE).

Based on recoveries from soil samples fortified with alachlor before extraction, there did not appear to be a great difference in the efficiency of the extraction procedure employed in 1977 and that used in 1978 and 1979; all recoveries for Sites 101 and 106 averaged 83% in 1977 and 93 and 86%, respectively, in 1978 and 1979. However, comparisons in the laboratory, especially those involving field-treated and weathered samples, showed that the method used in 1978 and 1979 was more effective for extracting alachlor from the organic soil than the method used in 1977. This conclusion is confirmed by the analytical data showing that the alachlor residues were higher in most cases in 1978 and 1979 than for corresponding sampling times in 1977; according to the farm operators who applied the herbicide, the rates of application were the same in all years.

Analysis of a number of soils samples was repeated during the course of the study. The data in Tables 22 and 23 show that many of the duplicate analyses agreed relatively well, but several diverged rather widely.

Duplicate analysis of water samples were not performed because each sample was used in total for the original analysis. However, recovery samples were routinely carried through the procedure, and the results are provided at the ends of appropriate tables. For all water analyses performed over the 3-year period, the recovery for alachlor varied from a low of 48% to a high of 108%. If a single low recovery is eliminated, the range was from 72 to 108%. Most values fell between 80 and 100%.

Table 22. Original analytical values, rerun values, and averages for alachlor in selected soil samples from Site 101.

Year	Plot	Time after appli. (days)	Sampling depth (cm)	Anal 1 (ppm)	Anal 2 (ppm)	Avg (ppm)
1977	I	248	0-7.5	0.91	0.80	0.86
1978	I	0	0-5	6.09	4.29	5.19
	IV	0	0-5	6.85	6.74	6.80
	II	1	0-5	4.22	3.23	3.72
	III	2	0-5	3.95	2.80	3.38
	I	4	0-5	4.93	5.50	5.22
	IV	4	0-5	2.00	2.07	2.04
	II	5	0-5	4.94	4.51	4.72
	IV	5	0-5	4.11	3.85	3.98
	II	7	0-5	5.26	4.73	5.00
	III	7	0-5	4.24	3.49	3.86
	II	16	7.5-15	0.15	0.12	0.14
	II	16	15-30	0.03	0.02	0.02
	IV	88	0-7.5	0.48	0.45	0.46
	IV	88	7.5-15	0.09	0.10	0.10
	IV	88	15-30	<0.02	<0.02	<0.02
	III	292	7.5-15	0.34	0.27	0.30
1979	I	1	0-5	22.7	12.7	17.7
	II	1	0-5	15.7	9.32	12.5
	I	27	0-15	2.86	2.84	2.85
	II	27	0-15	2.40	1.94	2.17
	III	27	0-15	3.30	2.40	2.85
	IV	27	0-15	3.39	3.06	3.22

Table 23. Original analytical values, rerun values, and averages for alachlor in selected soil samples from Site 106.

Year	Plot	Time after appli. (days)	Sampling depth (cm)	Anal 1 (ppm)	Anal 2 (ppm)	Anal 3 (ppm)	Anal 4 (ppm)	Avg (ppm)
1978	I	3	0-5	11.7	9.34			10.5
	III	5	0-5	12.0	10.2			11.1
	IV	5	0-5	17.3	15.3			16.3
	III	6	0-5	18.3	13.9			16.1
	IV	8	0-5	8.45	6.78			7.62
	I	333	0-7.5	0.70	0.75			.72
	I	333	7.5-15	0.77	0.56			.66
	I	333	15-30	0.89	0.75			.82
	IV	335	7.5-15	1.64	1.15			1.40
1979	III	2	0-5	17.9	15.8			16.8
	IV	2	0-5	16.9	15.6			16.2
	I	16	0-15	16.9	8.23	14.9		13.3
	II	16	0-15	21.2	11.2	13.4		15.3
	III	16	0-15	7.03	9.74	4.32	8.79	7.47
	IV	16	0-15	15.0	5.52	17.8		12.8
	III	16	15-22.5	1.09	0.96			1.02
	III	16	22.5-30	6.21	3.73	2.30	3.90	4.04
	III	63	0-15	6.73	3.07	3.74		4.51
	I	63	15-22.5	0.11	0.04			0.08
	III	63	15-22.5	5.43	1.68	3.83		3.65
	I	63	22.5-30	1.67	1.05	1.68		1.47

Regardless of the variation of values for repeated soil samples, we believe the analyses, especially during the second and third years of the study, were within the limits of acceptability for the types of samples being analyzed. We, therefore, believe that interpretations on the persistence and movement of alachlor in water and organic soils, that are based on the results presented herein, are meaningful.

Verification of the Rate of Application

Scientists engaged in research with pesticides, both from the standpoint of pest control and environmental effects, have long been concerned about the amounts of chemicals that are deposited on target sites. One objective of this study was to determine the accuracy of the applicators to apply the intended amount of herbicide.

Alachlor concentrations in soil samples collected immediately after application in 1977 and 1978 are recorded in Table 24. From the ppm values, the surface area sampled, and the weight of soil in the samples, the amount of alachlor in kilograms per hectare was calculated. Deviations of the amounts calculated to be present in the soil surface from those reported to have been applied by the applicators were large, especially in 1977 (Table 24). According to the calculations, we recovered only 25 and 31% of the amount applied to Sites 101 and 106, respectively, in 1977. Based on the same approach in 1978, we recovered about 58% of the amount applied to Site 101. We were unable to obtain Day 0 samples for Site 106 in 1978 and, hence, were unable to attempt to confirm the application rate to that site. One possible explanation for the better agreement in 1978 between the calculated rate and that reported by the applicator is the change in analytical procedure before analyzing the 1978 samples.

Day 0 soil samples were not taken in 1979. Instead, filter papers were laid upon the soil surface before application and were collected immediately after. Analyses of the filter paper samples show that the calculated rate of application for both sites, when averaged over the four plots within each site, exceeded the rate reported by the applicator (Table 25). It is important to note that for Site 106 the high calculated rate was caused by the contribution of one of the four plots. The better confirmation of the application rate in 1979 may be attributed in part to the good recovery of alachlor from filter paper (95 to 100%)

and the ability to obtain a more representative measure of surface distribution by the use of filter paper. The applicators employed by the farm managers were not necessarily the same ones for both sites over the 3 years, but it would be foolish to assume that they applied only 30% of the amount they intended to apply in 1977.

Table 24. Rates of application of alachlor as determined by residue analysis of soil samples collected immediately after application.

Site	Year	Plot no	Determined by analysis (ppm)	Determined by analysis (kg/ha)	Deviation from 4.48 kg/ha (kg/ha)
101[a]	1977	I	4.55	1.08	-3.40
		II	4.62	0.99	-3.49
		III	5.53	1.15	-3.33
		IV	9.75	1.18	-3.30
		Avg		1.10	-3.38
	1978	I	6.09	2.56	-1.92
		II	5.92	2.63	-1.85
		III	7.16	2.70	-1.78
		IV	6.85	2.45	-2.03
		Avg		2.58	-1.90
106[a]	1977	I	13.27	1.75	-2.73
		II	9.22	1.19	-3.29
		III	11.08	1.62	-2.86
		IV	7.69	0.93	-3.55
		Avg		1.37	-3.11

[a] Day-0 samples were not obtained in 1978 for Site 106. Filter papers were laid on the soil surface during application in 1979 to confirm the rate of application (Table 25).

Table 25. Rates of application of alachlor as determined by the amounts of alachlor deposited on filter papers during spraying in 1979.

Site	Plot no	Amount of alachlor per 460.2 cm^2 (µg)	Application rate, determined by analysis of filter papers (kg/ha)	Deviation from 4.48 kg/ha (kg/ha)
101	I	27,862	6.05	1.57
	II	27,661	6.01	1.53
	III	15,551	3.38	-1.10
	IV	18,088	3.93	-0.55
	Avg	22,290	4.84	0.36
106	I	34,116	7.41	2.93
	II	23,383	5.08	0.60
	III	21,629	4.7	0.22
	IV	21,707	4.72	0.24
	Avg	23,209	5.48	1.00

Recoveries of alachlor from filter papers:

Spiking level (µg/filter paper sample)	Recovery (%)
11,340	95
22,690	99
34,030	100

Confirmation of the rate of application by sampling the surface soil layer immediately after application is poor. Use of the Smith Surface Soil Sampler[1/] provides a marked improvement over split tube samplers, but even use of this implement may lead to erroneous results on some soils. The high organic matter soils are extremely powdery when loose and dry, and use of filter paper or some other solid surface may be the only means of confirming the application rate accurately.

Variation of Alachlor Residues Within Sprayed Fields

In 1977, four 0.4-hectare plots at each experimental site were sampled intensively to determine the distribution of alachlor over the sprayed fields. The results of these analyses are given in Table 26 for Site 101 and Table 27 for Site 106. The herbicide was applied by ground equipment, and soil samples were taken immediately thereafter and at 1, 5, 14, and 28 days after application at Site 101 and at 1, 7, and 29 days after application at Site 106.

The results show, for Day 0 samples, extreme variation in the levels of alachlor from different points within some plots (Tables 26 and 27); in others variation was well within acceptable limits. For example, contrast values for Plot III, Day 0, Site 101 where alachlor residues varied from 4.88 to 6.85 ppm (Table 26) to those for Plot I, Day 0, Site 106 where levels varied from 1.67 to 39.84 (Table 27). It is important to keep in mind that the experimental sites were high organic soils containing fragments of wood, which were by necessity, avoided during sampling or which were removed, again because of necessity, during preparation of samples for analysis. The soil surface was often very rough which contributed to uneven distribution of sprays.

The data in Tables 26 and 27 were subjected to statistical analysis to compare the variation among plots, experimental sites, and days after application. An estimate of variance within each small data set (either six or seven values per plot) was calculated for each plot and for several sampling dates for each site (Tables 28 and 29), and an analysis of variance was performed on the logarithms (base 10) of the estimates of variance. For convenience, the value 2 was added to each logarithm for the analysis of variance. The results show that variance among sites within plots generally decreased with time after application (Tables 28 and 29). As will be discussed in the section following, residue levels were also decreasing with time, and this trend itself would likely tend to reduce variation.

Table 26. Residues of alachlor in surface soil samples collected from Site 101 after application July 20, 1977.

Sampling time (days after application	Sample no.a,b,c/	Plot I (ppm)	Plot II (ppm)	Plot III (ppm)	Plot IV (ppm)	Avg (ppm)
0	1	5.04	4.97	4.99	4.70	
	2		6.76	4.88	9.11	
	3	3.52	3.56	4.94	7.54	
	4	3.22	3.76	6.66	9.42	
	5	4.91	5.42	5.29	8.94	
	6	5.25	4.08	5.10	12.6	
	7	5.37	3.76	6.85	16.0	
	Plot avg	4.55	4.62	5.53	9.75	6.11
1	1	8.36	4.75	5.83	10.4	
	2	1.48	9.16	6.48	3.91	
	3	9.73	8.42	3.38	7.96	
	4	5.23	8.27	10.2	11.9	
	5	3.18	11.9	4.95	12.7	
	6	4.07	5.58	4.92	7.96	
	7	5.73	8.36	7.37	7.24	
	Plot avg	5.40	8.07	6.16	8.86	7.12
5	1	6.73	3.98	2.51	2.23	
	2	3.37	1.90	3.40	3.42	
	3	2.69	3.03	7.64	3.04	
	4	4.79	3.86	1.67	3.79	
	5	3.40	1.32	6.37	3.15	
	6	4.11	4.65	4.15	3.00	
	7	5.53	2.50	7.44	3.07	
	Plot avg	4.37	3.03	4.74	3.10	3.81
14	1	1.15	1.24	1.19	1.71	
	2		1.46	1.18	2.78	
	3	1.63	2.10	1.79	1.04	
	4	2.06	0.85	1.79	1.47	
	5	1.61	1.29	2.02	2.36	
	6	2.86	1.97	1.65	2.41	
	7	1.06	1.49	1.46	0.56	
	Plot avg	1.73	1.49	1.58	1.76	1.64

Table 26. (continued)

Sampling time (days after application)	Sample no.[a,b,c]	Plot I (ppm)	Plot II (ppm)	Plot III (ppm)	Plot IV (ppm)	Avg (ppm)
28	1	0.57	2.12	0.43	1.35	
	2	0.23	1.39	0.57	1.19	
	3	1.09	0.99	0.66	1.65	
	4	1.17	1.19	0.80	1.04	
	5	0.77	0.88	1.13	0.81	
	6	0.80	0.99	0.99	1.12	
	7	0.47	0.38	0.85	0.79	
	Plot avg	0.73	1.13	0.78	1.14	0.94

[a] Sample no. denotes relative position in field. The first sample (No. 1) was collected about 3 meters from ditch at center field. Successive samples were collected at 3-meter intervals moving from ditch toward windrow at the perimeter of the field.

[b] Samples for Day 0, Day 1, and Day 5 were taken from the 0 to 5 cm depth; those for Day 14 and Day 28 were taken from the 0 to 7.5 cm depth.

[c] Recoveries given in Table 30 for 1977 apply here.

Table 27. Residues of alachlor in surface soil in field Site 106 after application June 21, 1977.

Sampling time (days after application)	Sample no.[a,b,c]	Plot I (ppm)	Plot II (ppm)	Plot III (ppm)	Plot IV (ppm)	Avg (ppm)
0	1	8.10	10.5	11.8	6.00	
	2	6.03	8.80		9.60	
	3	18.9	7.34	4.63	2.27	
	4	7.80	16.9	14.0	10.1	
	5	10.6	5.38	32.7	8.54	
	6	39.8	3.44	0.06	6.89	
	7	1.67	12.2	3.22	10.4	
	Plot avg	13.27	9.22	11.08	7.69	10.32
1	1	10.8	14.6	5.79	10.1	
	2	4.61	62.6	1.65	9.44	
	3	7.76	3.24	4.65	5.40	
	4	6.08	4.05	10.2	5.39	
	5	10.2	6.64	3.90	5.28	
	6	10.2	4.93	7.56	9.08	
	7	0.04	14.4	9.01	9.20	
	Plot avg	7.08	15.80	6.11	7.70	9.17
7	1	11.7	3.70	2.20	2.38	
	2	2.94	6.51	2.56	8.25	
	3	3.08	4.05	3.68	3.56	
	4	1.92	6.23	5.42	3.70	
	5	11.3	2.92	1.68	4.48	
	6	3.78	5.04	3.91	3.78	
	7	5.61	7.92	14.7	0.14	
	Plot avg	5.77	5.20	4.88	3.76	4.90
29	1	1.20	1.16	3.28	1.29	
	2	1.06	0.44	0.91	2.24	
	3	0.46	1.21	1.92	0.07	
	4	0.88	0.72	0.83	2.35	
	5	3.43	2.87	1.74	1.85	
	6	0.60	1.72	0.36	1.82	
	7	0.61	1.40	0.78	2.83	
	Plot avg	1.18	1.36	1.40	1.78	1.43

[a] Sample no. denotes relative position in field. The first sample (No.1) was collected about 3 meters from drainage ditch at the center of the field. Successive samples were collected at 3-meter intervals, moving from ditch toward windrow at perimeter of field.

[b] Samples for Day 0, Day 1, and Day 7 were taken from the 0 to 5 cm depth; those for Day 29 were taken from the 0 to 7.5 cm depth.

[c] Recoveries given in Table 31 for 1977 apply here.

Table 28. Variance (s^2) and 2 + $\log_{10}$ of variance for alachlor residues in samples of soil taken within plots after application to Site 101 in 1977.

Sampling time (days after application)	Plot I[a]		Plot II		Plot III		Plot IV		Avg
	Var.	$\log_{10}$	Var.	$\log_{10}$	Var.	$\log_{10}$	Var.	$\log_{10}$	$\log_{10}$
0	0.8724	1.9407	1.3727	2.1376	0.7207	1.8577	13.0981	3.1172	2.2633
1	8.2853	2.9183	5.6057	2.7486	4.7476	2.6764	9.1460	2.9612	2.8261
5	1.9870	2.2982	1.4496	2.1612	5.8164	2.7647	0.2254	1.3530	2.1443
14	0.4391	1.6426	0.1870	1.2719	0.1022	1.0094	0.6446	1.8093	1.4333
28	0.1121	1.0498	0.2859	1.4562	0.0588	0.7693	0.0914	0.9609	1.0590
$LSD_{(.05)}$ for use with means for days after application expressed as $\log_{10}$									0.7190

[a] Each variance was calculated from residue values for seven individual soil samples. For statistical analysis the variances were transformed to logarithms, and all logarithms were made positive by adding 2 to each.

Table 29. Variance (s^2) and 2 + $\log_{10}$ of the variance for alachlor residues in samples of soil taken within plots after application to Site 106 in 1977.

Sampling time (days after application)	Plot I[a]		Plot II		Plot III		Plot IV		Avg Log_{10}
	Var.	Log_{10}	Var.	Log_{10}	Var.	Log_{10}	Var.	Log_{10}	
0	164.6438	4.2165	20.2110	3.3056	140.6223	4.1481	8.4173	2.9252	3.6489
1	14.9485	3.1746	449.1889	4.6524	9.0417	2.9563	4.9282	2.6927	3.3690
7	16.7865	3.2250	3.1620	2.5000	20.2529	3.3065	5.9551	2.7749	2.9516
29	1.0578	2.0244	0.6216	1.7935	0.9919	1.9965	0.8016	1.9040	1.9296
$\text{LSD}_{(.05)}$ for use with means for days after application expressed as $\log_{10}$									0.9416

[a] Each variance was calculated from residue values for seven individual soil samples. For statistical analysis the variances were transformed to logarithms, and all logarithms were made positive by adding 2 to each.

It is interesting to note that, although variation within plots was high, especially at Day 0 and Day 1 samplings, plot averages generally fell within an expected range. At Day 0, Site 101, average residues for Plots I, II, III, and IV were 4.6, 4.6, 5.5, and 9.8 ppm, respectively; for Site 106, corresponding values were 13.3, 9.2, 11.1, and 7.7 ppm. For later sampling times the same year, plot averages even gave better agreement; for Site 101 at Day 14, the four values were 1.7, 1.5, 1.6, and 1.8 ppm and for Site 106 at Day 29 the values were 1.2, 1.4, 1.4, and 1.8 ppm.

The detailed sampling of soil was not repeated after adopting a different method of analysis in 1978. However, the variance among samples would probably remain essentially unchanged.

Disappearance of Alachlor from Soils

Alachlor concentrations at several times after application in 1977, 1978, and 1979 are shown for Sites 101 and 106 in Tables 30 and 31. Alachlor disappeared rapidly from the surface layer of the organic soils during the first 2 to 4 weeks after application. Analyses of soil samples from depths between 7.5 and 30 cm in 1977 and 1978 and from depths between 15 and 30 cm in 1979 revealed the presence of low concentrations of the herbicide, but amounts were far too low to account for the large losses from the surface soil layer. Smith and Phillips (1975) reported rapid change of alachlor by the fungus *Rhizoctonia solani* in the presence of another carbon source (sucrose), and microbial activity was, most likely, high under the prevailing conditions of the present study.

Detectable levels of alachlor, as determined by retention time in an electron-capture gas chromatograph, were found in samples taken in the springs of 1978 and 1979 before reapplying the herbicide (Tables 30 and 31). Measurable concentrations were found in most soil samples from both experimental sites between 248 and 335 days after application in 1977 and 1978. However, concentrations found in the 15 to 30-cm layer of Site 101 were lower (often <0.02 ppm) than those for the same depth of Site 106. In all cases, the greatest average residue was in the surface 0 to 7.5-cm layer and ranged from 0.55 to 1.07 ppm. Averaging the residue concentrations for the samples, collected in the spring, by depths over years and over experimental sites yielded values of 0.70,

Table 30. Residues of alachlor in soil samples from different depths and times after application at Site 101.

Year	Time after appli. (days)	Sampling depth (cm)	Alachlor				
			Plot I (ppm)	Plot II (ppm)	Plot III (ppm)	Plot IV (ppm)	Avg (ppm)
1977	0	0-5	4.55	4.62	5.53	9.75	6.11
	1	0-5	5.40	8.06	6.16	8.86	7.12
	5	0-5	4.37	3.03	4.74	3.10	3.81
	14	0-7.5	1.73	1.49	1.58	1.76	1.64
		7.5-15	0.06	0.11	0.06	0.05	0.07
		15-30	<0.02	<0.02	<0.02	<0.02	<0.02
	28	0-7.5	0.73	1.13	0.78	1.14	0.95
		7.5-15	0.29	0.02	0.02	0.04	0.09
		15-30	<0.02	<0.02	<0.02	<0.02	<0.02
	56	0-7.5	0.16	0.26	0.20	0.08	0.18
		7.5-15	<0.02	<0.02	<0.02	<0.02	<0.02
		15-30	<0.02	<0.02	<0.02	<0.02	<0.02
	248	0-7.5	0.91	0.58	0.49	0.26	0.56
		7.5-15	0.07	0.05	0.03	<0.02	0.04
		15-30	<0.02	<0.02	<0.02	<0.02	<0.02
1978	0	0-5	6.09	5.92	7.16	6.85	6.50
	1	0-5	3.61	4.22	5.10	3.91	4.21
	2	0-5	3.36	4.50	3.95	3.09	3.72
	4	0-5	4.93	4.33	2.63	2.00	3.47
	5	0-5	3.65	4.94	3.87	4.11	4.14
	7	0-5	2.71	5.26	4.24	2.50	3.68
	16	0-7.5	1.34	2.47	1.52	2.61	1.98
		7.5-15	0.23	0.15	0.26	0.15	0.20
		15-30	0.03	0.03	<0.02	<0.02	0.02
	88	0-7.5	0.37	0.46	0.56	0.48	0.47
		7.5-15	0.09	0.07	0.04	0.09	0.07
		15-30	<0.02	<0.02	<0.02	<0.02	<0.02
	292	0-7.5	0.47	0.72	0.48	0.63	0.58
		7.5-15	0.38	0.28	0.34	0.64	0.41
		15-30	0.02	<0.02	<0.02	0.04	0.02

Table 30. (continued)

Year	Time after appli. (days)	Sampling depth (cm)	Alachlor				
			Plot I (ppm)	Plot II (ppm)	Plot III (ppm)	Plot IV (ppm)	Avg (ppm)
1979	1	0-5	22.7	15.7	15.9	15.4	17.4
	27	0-15	2.86	2.40	3.30	3.39	2.99
		15-22.5	0.22	0.17	0.07	0.30	0.19
		22.5-30	0.14	0.07	0.19	0.03	0.11
	88	0-15	0.99	0.29	0.40	1.29	0.74
		15-22.5	<0.02	0.07	<0.02	<0.02	0.02
		22.5-30	0.02	0.04	0.14	<0.02	0.05

Recoveries from soil:

Spiking Level (ppm)	1977 (%)	1978 (%)	1979 (%)
0.018	78		
0.020		77, 81, 85	72, 70, 54
0.036	77, 82, 60		
0.050			88
0.074	89, 89, 90, 91		
0.10		87, 99, 93	
0.20			80
0.40	90, 81		
0.50		93, 87	88, 87
1.00		97, 86	97
2.00		95, 106	92, 97
4.00		109	
5.00		86	92
10.0		94, 96	97
20.0			94

Table 31. Residues of alachlor in soil samples from different depths and times after application at Site 106.

Year	Time after appli. (days)	Sampling depth (cm)	Alachlor Plot I (ppm)	Plot II (ppm)	Plot III (ppm)	Plot IV (ppm)	Avg (ppm)
1977	0	0-5	13.3	9.22	11.1	7.69	10.3
	1	0-5	7.08	15.8	6.11	7.70	9.17
	7	0-5	5.77	5.20	4.88	3.76	4.90
	29	0-7.5	1.18	1.36	1.40	1.78	1.43
		7.5-15	0.18	0.10	0.06	0.07	0.10
		15-30	0.09	0.02	0.02	0.02	0.04
	56	0-7.5	0.41	0.64	0.43	0.40	0.47
		7.5-15	0.05	0.05	0.02	0.04	0.04
		15-30	0.03	0.03	0.02	0.03	0.03
	307	0-7.5	1.16	0.11	0.52	0.59	0.60
		7.5-15	0.11	0.30	1.2	0.45	0.52
		15-30	0.20	0.05	0.06	0.07	0.10
1978	3	0-5	11.7		14.7		13.2
	5	0-5	9.80	12.8	12.0	17.3	13.0
	6	0-5	8.41		18.3		13.4
	7	0-5		11.9		9.53	10.7
	8	0-5		11.1		8.45	9.78
	333, 335[a]	0-7.5	0.70	0.84	1.37	1.36	1.07
		7.5-15	0.77	0.71	0.81	1.64	0.98
		15-30	0.89	0.14	0.15	0.71	0.47
1979	2	0-5	19.8	26.4	17.9	16.9	20.25
	16	0-15	16.9	21.2	7.03	15.0	15.0
		15-22.5	0.88	1.56	1.09	1.46	1.25
		22.5-30	0.81	1.54	6.21	0.78	2.34
	63	0-15	1.88	4.83	6.73	4.32	4.44
		15-22.5	0.11	0.84	5.43	1.20	1.90
		22.5-30	1.67	0.80	0.81	0.25	0.88

[a] Application dates in 1978 were: Plots I, III on July 3 and Plots II, IV on July 1.

Table 31. (continued)

Recoveries from soil:

Spiking Level (ppm)	1977 (%)	1978 (%)	1979 (%)
0.018	78*		
0.020		110	56, 75
0.036	77*, 82*, 60*		
0.074	88*, 89*, 90*, 91*		
0.10		79	72
0.20		78	
0.40	90*, 81*		
0.50			93, 101
1.0			89, 100, 91
5.0			86
10.		121	97
16.7		99	

*Recoveries marked with an asterisk are also listed for Site 101 (Table 30).

0.46, and 0.15 ppm for soil depths of 0 to 7.5, 7.5 to 15, and 15 to 30 cm, respectively. Soil samples were not taken below 30 cm.

The persistence of alachlor from one season to the next has not been reported for alachlor in mineral soils. That low levels of "apparent" alachlor were detected over 300 days after application in this study may be related to the kind of soil; i.e., high organic soil. Association of the herbicide molecules with some fraction of the organic matter may have rendered a portion of the herbicide unavailable for degradation by soil microorganisms. Because of the highly organic nature of these soils, there should be no hazard to rotational crops; and it is doubtful that any major accumulation of the carryover residue would occur from repeated use.

Contamination of Surface Water

Concentrations of alachlor in discharge water samples taken from the weirs during and after several rainfall events following application were recorded for each year and experimental site, and losses of alachlor in water draining through the weirs were estimated for selected time periods (Tables 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43). The estimates of alachlor loss in milligrams were calculated from measured volumes of water discharged over a specific time and the concentration of alachlor in a grab sample collected during the period of discharge.

The peak concentrations of alachlor appeared to coincide with peak flow from Site 101 after application in 1977 (Table 32), but this relation was not as apparent for Site 106 (Table 34). The first rainfall after herbicide application at Site 101 was a violent thunderstorm which came about 40 hr after treatment. Five centimeters of rain fell in 2 hr, resulting in significant runoff. As the flow in the V-ditch increased, concentrations of alachlor in the drainage water increased, with peak concentration of alachlor occurring at nearly the same time as peak flow (Table 32). This peak concentration (79 ng/ml) was the highest detected in drainage water from both sites in 1977. The second storm at Site 101 resulted in a smaller volume of runoff, and peak concentration of alachlor was 54 ng/ml. During this storm on July 26, the cumulative total of alachlor discharged through the weir was estimated at 288 mg (Table 33). This is less than 0.002% of the amount applied to the 7.4-ha field.

Table 32. Concentrations of alachlor in drainage water (grab samples) from the weir at Site 101, after application of alachlor July 20, 1977.

Event	Sampling date	Time after appli. (days)	Sampling date	Flow condition	Alachlor (ng/ml)
I[a/]	7-22-77	2	0030	1/4 peak, rising	40
			0130	3/4 peak, rising	62
			0230	peak	79
			0430	1/4 base, falling	70
			1400	1/2 base, falling	62
	7-23-77	3	1200	base	40
II[b/]	7-26-77	6	0600	1/4 peak, rising	40
			0800	1/2 peak, rising	32
			0900	3/4 peak, rising	54
			1045	peak	44
			1500	1/4 base, falling	46
	7-27-77	7	0700	base	23

[a/] A total of 5 cm of rain.

[b/] A total of 1 cm of rain.

Recoveries from water:	Spiking Level (ppm)	Recovery (%)
	0.48	48, 78
	0.97	88, 92, 98, 92, 99, 102

Table 33. Estimated losses of alachlor in drainage water during specific times after application to Site 101 in 1977.

Sampling date	Sampling time	Time bracket used in calculation[a/]	Number of hours	Volume of discharge (liters)	Concn of alachlor (ng/ml)	Alachlor in drainage	
						Individual times (mg)	Cumulative (mg)
7-23-77	1200	0800-1600	8	5967	40	239	239
7-26-77	0600	0400-0700	3	560	40	22	261
	0800	0700-0900	2	700	32	22	283
	0900	0900-1000	1	485	54	26	309
	1045	1000-1200	2	969	44	43	352
	1500	1200-2000	8	3796	46	175	527

[a/] The time brackets used in the calculations depended on the flow data available and on the time of sampling. Volumes for discharge are not available for the first rainfall event on July 22, 1977.

Table 34. Concentrations of alachlor in drainage water (grab samples) from the weir at Site 106, after application of alachlor June 21, 1977.

Event	Sampling date	Time after appli. (days)	Sampling time	Flow condition	Alachlor (ng/ml)
I[a]	6-23-77	2	0940	base	52
			1550	1/10 peak	34
	6-24-77	3	0115	1/3 peak	25
			0845	1/2 peak	21
			2030	3/4 peak	18
	6-25-77	4	0530	peak	8.6
			0830	1/3 base	8.2
			1135	1/2 base	2.4
	6-26-77	5	0800	base	2.5
II[b]	7-1-77	10	2015	1/3 peak	8.7
			2030	1/2 peak	14
			2130	2/3 peak	12
			2230	3/4 peak	10
			2350	peak	13
	7-2-77	11	0150	1/4 base	11
			0515	1/2 base	22
	7-3-77	12	0900	base	17

[a] A total of 2.8 cm of rain.

[b] A total of 7 cm of rain.

Recoveries from water:

Spiking Level (ppm)	Recovery (%)
0.48	48, 78
0.97	88, 92, 98, 92, 99, 102

These recovery values are also listed for Site 101 in 1977. (Table 32).

The first posttreatment runoff event at Site 106 was a slow drizzle which occurred about 2 days after treatment. No visible surface drainage into the V-ditch occurred. Analysis of successive samplings of discharge water during this event indicated decreasing concentrations of alachlor (Table 34). Our interpretation of these data is that drift from the spraying operation contaminated the V-ditch; water entering the V-ditch by subsurface drainage removed this alachlor from the V-ditch as flow continued. By the time base flow was reached, alachlor was present in the drainage water in concentrations of 2.5 ng/ml. The second storm at Site 106 occurred about 10 days after application. About 3 cm of rain fell in the first 3 hr of the storm, resulting in heavy runoff, and alachlor concentrations increased over those for base flow after the first event. The highest concentration of alachlor in the drainage water during the second storm was 22 ng/ml.

The cumulative loss data during the sampling period for Site 106 in 1977 were incomplete; but for the storms covered, it amounted to about 3100 mg, or less than 0.01% of the amount applied to the 7.4-ha field (Table 35).

During the remainder of the summer of 1977, no grab samples were taken. Drought conditions were so severe that no water flowed in the drainage ditches except during isolated thunderstorms. We were unable to predict the occurrence of these storms well enough to reach the sites during runoff periods.

Alachlor concentrations in surface water draining from Site 101 in 1978 were similar to those for both sites in 1977 (Table 36). A greater number of samples were analyzed in 1978 than in 1977, and concentrations after the last event on Site 101 amounted to 8.7 ng/ml 26 days after application. Calculations for alachlor loss from Site 101 during storm events were more complete in 1978 than in 1977, and the estimate for total loss was greater in 1978, amounting to about 13,000 mg over the sampling period (Table 37) or about 0.04% of the amount applied.

Concentrations of alachlor in water from Site 106 in 1978 were only a fraction of those for Site 106 in 1977 and Site 101 in 1977 and 1978 (Table 38). The first rainfall event on Site 106 in 1978 occurred only 2 to 4 days after application; only one sample was obtained, and it was past the peak. The concentration was 2.3 ng/ml, far below all values previously found for first-event samples. No explanation for this

Table 35. Estimated losses of alachlor in drainage water during specific times after application to Site 106 in 1977.

Sampling date	Sampling time	Time bracket used in calculation[a]	Number of hours	Volume of discharge (liters)	Concn of alachlor (ng/ml)	Alachlor in drainage Individual times (mg)	 cumulative (mg)
6-23-77	0940	0800-1200	4	390	52	20	20
	1550	1200-2100	9	612	34	21	41
6-24-77	0115	(6/23)2100-0500	8	805	25	20	61
	0845	0500-1400	9	1,033	21	22	83
	2030	1400-2400	10	967	18	17	100
7-1-77	2015 2030	1800-2100	3	11,628	8.7 14 } 11.35[b]	132	232
	2130	2100-2200	1	15,988	12	192	424
	2230	2200-2300	1	14,561	10	146	570
	2350	2300-2400	1	14,560	13	189	759
7-2-77	0150	0000-0300	3	32,851	11	361	1,120
	0515	0300-2400	21	91,768	22	2,019	3,139

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[a] The time brackets used in the calculations depended on the flow data available and on the time of sampling. Volumes of discharge are not available for several sampling times.

[b] The average concentration of alachlor in two water samples taken 15 min apart was used to calculate the amount of alachlor in drainage for this time bracket.

Table 36. Concentrations of alachlor in drainage water from the weir at Site 101 after application of alachlor June 29, 1978.

Event	Sampling date	Time after appli. (days)	Time	Flow condition	Alachlor (ng/ml)
I (grab)[a/]	7-11-78	12	1000	1/8 rising	68.
(grab)			1300	Past peak ½ hr, 3-cm fall	53.
(comp)			1300	Covers rising flow	56.
(grab)			1800		44.
(comp)			1800		54.
I (grab)	7-12-78	13	1145		42.
(grab)			1800		44.
I (grab)	7-14-78	15		Base	56.
II (grab)	7-16-78	17	1220	Base	50.
(comp)			1220		38.
(grab)			1700	Slight flow	35.
II (grab)	7-17-78	18	0500	Double that of 7-16-78	25.
(comp)			0500		31.
(grab)			2030	2.5 cm in weir	21.
III (grab)	7-20-78	21	1400	5 cm in weir	20.
(comp)			1400	Covers III from base to 1 hr after peak	18.
(grab)			1700	5 cm in weir	19.
III (grab)	7-21-78	22	1200	3.4 cm in weir	18.
(comp)			1200	3.4 cm in weir	15.
III (grab)	7-23-78	24	1830	Base	17.
(comp)			1830		12.
IV (grab)	7-25-78	26	1100	Past peak	4.1
(grab)			1745		8.7

Table 36. (continued)

Event	Sampling date	Time after appli. (days)	Time	Flow condition	Alachlor (ng/ml)
	4-17-79	292			<0.50
	5-4-79	309	1715	No flow	<0.50
	5-5-79	310	0630		0.75
			0820		<0.50

[a] The abbreviations "grab" and "comp" indicate, respectively, grab and composite samples.

Recoveries from water:

Spiking Level (ppm)	Recovery (%)
0.50	88
1.0	94
10.	108, 92
100.	101, 92

Table 37. Estimated losses of alachlor in drainage water during specific times after application to Site 101 in 1978.

Sampling date	Sampling time	Time bracket used in calculation[a/]	Number of hours	Volume of discharge (liters)	Concn of alachlor (ng/ml)	Individual times (mg)	cumulative (mg)
7-11-78	1300 grab	1200-1600	4	159,429	53	8,450	8,450
	1800 grab	1600-2000	4	56,834	44	2,501	10,951
7-12-78	1145 grab	1000-1400	4	8,878	42	373	11,324
	1800 grab	1400-2000	6	7,701	44	339	11,663
7-16-78	1220 grab	0800-1600	8	4,672	50	234	11,897
	1700 grab	1600-2000	4	2,134	35	75	11,972
7-17-78	0500 grab	0400-1200	8	4,268	25	107	12,079
	2030 grab	1200-2400	12	25,081	21	527	12,606
7-20-78	1700 grab	1600-2000	4	23,684	19	450	13,056
7-21-78	1200 grab	0800-1200	4	1,113	18	20	13,076
7-23-78	1830 grab	1600-2000	4	922	17	16	13,092
7-25-78	1100 grab	0100-1200	11	16,941	4.1	69	13,161
	1745 grab	1200-2400	12	12,807	8.7	111	13,272
5-4-79	1715	1600-2000	4	0	<0.50	0	
5-5-79	0630	0400-0700	3	640	0.75	<1	
	0820	0700-2400	17	12,846	<0.50	<6	

[a/] The time bracket used in the calculations depended on the flow data available and on the time of sampling. Volumes of discharge are not available for several sampling times.

Table 38. Concentrations of alachlor in drainage water from the weir at Site 106 after application of alachlor July 1 and 3, 1978.

		Time after appli.[a] (days)				
Event	Sampling date	Plots I, III	Plots II, IV	Sampling time	Flow condition	Alachlor (ng/ml)
I (grab)	7-5-78	2	4	1600	Past peak 2.5 cm	2.3
II (comp)	7-11-78	8	10	0930	Before runoff began	1.9
(grab)				1200	Just beginning	2.9
(grab)				1630	Peak	2.3
II (grab)	7-12-78	9	11	1115		1.2
(grab)				1715		1.5
(comp)				1715		1.3
II (grab)	7-13-78	10	12	1045		1.2
(comp)				1045	Base	1.3
III (grab)	7-16-78	13	15	0800	Trickle	1.3
(comp)				0800		1.2
(grab)				1330	Light	1.4
(comp)				1330		1.3
(grab)				1745	Light	1.3
III (grab)	7-17-78	14	16	0600	Light	1.1
(comp)				0600		1.3
(grab)				2000	Base	1.1
IV (grab)	7-20-78	17	19	1500		0.8
(comp)				1500		0.6
IV (grab)	7-21-78	18	20	1000		0.9
(comp)				1000		0.9
IV (grab)	7-23-78	20	22	1730	1 cm flow	0.7
(comp)				1730		0.7
V (grab)	7-24-78	21	23	1900		0.7
(comp)				1900		0.7

Table 38. (continued)

Event	Sampling date	Time after appli.[a] (days) Plots I, III	Time after appli.[a] (days) Plots II, IV	Sampling time	Flow condition	Alachlor (ng/ml)
V (grab)	7-25-78	22	24	1030		1.0
(grab)				1715		1.0
	4-17-79	288	290			1.7
	5-31-79	332	334	1555		1.0
	6-4-79	336	338	0010		0.63
				0515		<0.5
				0820		<0.5

[a] Plots I, III treated 7-3-78
Plots II, IV treated 7-1-78

[b] The abbreviations "grab" and "comp" indicate, respectively, grab and composite samples.

Recoveries from water:

Spiking Level (ppm)	Recovery (%)
0.50	72
1.0	88
5.0	98
10.	100
50.	93, 95
100.	106

Table 39. Estimated losses of alachlor in drainage water during specific times after application to Site 106 in 1978.

Sampling date	Sampling time	Time bracket used in calculation[a/]	Number of hours	Volume of discharge (liters)	Concn of alachlor (ng/ml)	Alachlor in drainage: Individual times (mg)	Alachlor in drainage: Cumulative (mg)
7-11-78	0930 comp	0800-1100	3	12	1.9	<0.1	<0.1
	1200 grab	1100-1500	4	122	2.9	0.4	0.4
	1630 grab	1500-2000	5	2,366	2.3	5.4	5.8
7-12-78	1715 grab	1600-2000	4	438	1.5	0.7	6.5
7-13-78	1045 grab	0800-1200	4	543	1.2	0.7	7.2
7-16-78	0800 grab	0800-1100	3	68	1.3	<0.1	7.2
	1330 grab	1100-1600	5	113	1.4	0.2	7.4
	1745 grab	1600-2400	8	180	1.3	0.2	7.6
7-17-78	0600 grab	0000-1200	12	271	1.1	0.3	7.9
	2000 grab	1200-2000	8	181	1.1	0.2	8.1
7-20-78	1500 grab	1200-1600	4	90	0.8	<0.1	8.1
7-21-78	1000 grab	0800-1200	4	18	0.9	<0.1	8.1
7-23-78	1730 grab	1600-2000	4	0	0.7	0	8.1
7-24-78	1900 grab	1600-2000	4	14,558	0.7	10	18.1
7-25-78	1030 grab	0800-1400	6	15,377	1.0	15	33.1
6-4-79	0010 grab	0000-0300	3	1,390	0.63	0.9	34.0
	0515 grab	0300-0700	4	5,036	<0.5	<2.5	
	0820 grab	0700-1200	5	8,571	<0.5	<4.3	

[a/] The time brackets used in the calculations depended on the flow data available and on the time of sampling. Volumes of discharge are not available for several sampling times.

difference is readily apparent. There was very little water in the ditch at the time of spraying, but the same was true for 1977. Except for a sample taken near the beginning of runoff during the second event on Site 106 when the concentration was determined to be 2.9 ng/ml, the levels of alachlor in drainage water decreased with time.

Alachlor concentrations in drainage water from both sites in 1979 were far greater than for 1977 and 1978 (Tables 40 and 42). The highest concentration for Site 101 in 1979 was about 2570 ng/ml and for Site 106 about 2690 ng/ml. Computations have been rechecked to verify the values. It is difficult to rationalize the large differences between years. One obvious possibility is that alachlor was applied directly to the water in the V-ditch in 1979 and not in other years. Exact calculations are impossible, but a rough approximation strongly suggests that 25 to 50% of the rate applied to the soil surface reached the surface of the water in the V-ditches in 1979. These ditches were in close proximity to the sprayed areas, and the water contamination could probably have occurred through drift, especially if a wind of 6 to 12 km/hr was blowing. Because the applicators employed on this farm are reputable, we tend to believe that the contamination occurred by drift.

In 1979, the cumulative loss of alachlor from Site 101 over part of the sampling period was about 105,000 mg or about 0.32% of the total applied to the field. This sampling period appeared to be representative of an extreme condition. Discharge volumes were very high (Table 40) for the event beginning May 14, 1979; and the site was flooded on May 15 to the extent that flow through the weir was abnormal.

It was not possible to estimate the total loss of alachlor over the period of sampling because the data sets for water flow were incomplete. However, from the calculations made, it appears safe to conclude that the total loss of alachlor in discharge water did not exceed 1% of the amount applied annually to the experimental sites; and in most cases the loss was far less than 1%. This conclusion is supported by data for alachlor and other herbicides applied preplanting or preemergence to crops grown on mineral soils in North Carolina and elsewhere (Sheets and Neal 1979; Sheets et al. 1972; Smith et al. 1978).

Table 40. Concentrations of alachlor in drainage water (grab samples) from the weir at Site 101 after application on May 11, 1979.

Event	Sampling date	Time after appli. (days)	Time	Flow condition	Alachlor (ng/ml)
	5-11-79	0	1010	base	555
			1340	base	1456
			1820	base	2566
	5-12-79	1	1700	base	1762
I	5-14-79	3	0250	base	1828
			0600	1/2 peak, rising	1329
			0700	3/4 peak, rising	869
			0800	first peak	1742
			0900	second peak	570
			1230	between peaks	327
			1530	third peak	290
			1930	past peak	171
			2345	past peak	188
	5-15-79	4	0630	flooded, flow	225
			1630	not normal	233
	5-16-79	5	1900		328
	5-17-79	6	1920		271
II	5-18-79	7	1240		330
			1540	3/4 peak, rising	248
			1845	first peak	203
	5-19-79	8	0430	second peak	127
III	5-20-79	9	0230	base	35[a]
			1300	1/2 base, rising	86
	5-22-79	11	1920	near base	111
	6-6-79	26	1300	base	53
	7-3-79	53	1230	base	14

[a] The amount of XAD-2 resin brought in from the field was less than the average and also contained a lot of mud.

Recoveries from water:

Spiking Level (ppb)	Recovery (%)
0.50	87, 73
1.0	72, 91
5.0	100
10.	91
50.	105
100.	98, 79
200.	97
2000.	95

Table 41. Estimated losses of alachlor in drainage water during specific times after application to Site 101 in 1979.

Sampling date	Sampling time	Time bracket used in calculation[a/]	Number of hours	Volume of discharge (liters)	Concn of alachlor (ng/ml)	Alachlor in drainage: Individual times (mg)	Alachlor in drainage: Cumulative (mg)
5-11-79	1010	0800-1100	3	36	555	20	20
	1340	1100-1500	4	48	1,456	70	90
	1820	1500-2000	5	0	2,566	0	90
5-12-79	1700	1600-2000	4	30	1,762	53	143
5-14-79	0250	0100-0400	3	18	1,828	33	176
	0600	0400-0600	2	25,566	1,329	33,977	34,153
	0700	0600-0700	1	23,527	869	20,445	54,598
	0800	0700-0800	1	20,405	1,742	35,546	90,144
	0900	0800-0900	1	26,390	570	15,042	105,186

[a/] The time brackets used in the calculations depended on the flow data available and on the time of sampling. Volumes of discharge for sampling times after 0900 on May 14, 1979 could not be determined because the ditch was flooded.

Table 42. Concentrations of alachlor in drainage water (grab samples) from the weir at Site 106 after application on June 5, 1979.

Event	Sampling date	Time after appli. (days)	Time	Flow condition	Alachlor (ng/ml)
	6-5-79	0	2300	base	2530
	6-6-79	1	0800	base	1760
			1930	base	2689
I	6-11-79	6	1100	base	877
			1240	minute peak	832
			1440	base	818
			1830	3/4 peak, rising	759
			2310	3/4 peak, rising	600
	6-12-79	7	1730	just past peak	1067
	6-16-79	11	1115	subbase	902
II	6-17-79	12	1600	subbase	735
			1930	subbase	618
			2100	peak	413
	6-18-79	13	1030	subbase	689
III	6-22-79	17	0805	subbase	330
			0915	subbase	351
	6-24-79	19	1720	subbase	254
IV	7-15-79	40	2130	1/2 peak, rising	43
	7-16-79	41	0315	near peak	45
			0645	peak	49
			1600	1/2 peak, falling	48
			1945	1/2 peak, falling	44
	7-17-79	42	0745	base	53
			1430	base	45
V	7-18-79	43	1600	peak (very small)	39
VI	7-20-79	45	1630	3/4 peak, falling	23
	7-21-79	46	0730	base	15

Table 42. (continued)

Recoveries from water:

Spiking Level (ppb)	Recovery (%)
0.50	87*
1.0	72*, 125
5.0	100*, 90
10.	94
100.	96
200.	97*
1000.	93
2000.	96

*Same Recoveries that are listed for Site 101 in 1979 (Table 40).

Table 43. Estimated losses of alachlor in drainage water during specific times after application to Site 106 in 1979.

Sampling date	Sampling time	Time bracket used in calculation[a/]	Number of hours	Volume of discharge (liters)	Concn of alachlor (ng/ml)	Alachlor in drainage Individual times (mg)	Alachlor in drainage Cumulative (mg)
6-5-79	2300	2000-2400	4	2,423	2,530	6,130	6,130
6-6-79	0800	0100-1200	11	6,472	1,760	11,390	17,520
	1930	1200-2400	12	4,424	2,689	11,896	29,416
6-11-79	1100	0800-1200	4	10	877	9	29,425
	1240	1200-1300	1	8	832	7	29,432
	1440	1300-1600	3	93	818	76	29,508
	1830	1600-2000	4	391	759	297	29,805
	2310	2000-0100(6/12)	5	592	600	355	30,160
6-12-79	1730				1,067		
6-17-79	1115	0800-1200	4	0	902	0	30,160
6-17-79	1600	1200-1900	7	0	735	0	30,160
	1930	1900-2000	1	0.25	618	<1	30,160
	2100	2000-2400	4	2.9	413	1	30,161

[a/] The time brackets used in the calculations depended on the flow data available and on the time of sampling. Volumes of discharge are not available for several sampling times.

Alachlor is far less toxic to aquatic organisms than many other pesticides. The Herbicide Handbook of the Weed Science Society of America (1979) gives the 96-hr TL_m (median tolerance limit) for bluegill to alachlor as 13.4 ppm. The same source listed the LD_{50} of alachlor as 6.5 and 19.5 ppm (in 96 hr) for catfish and crayfish, respectively. Fish do not normally inhabit the water in the small V-ditches or the large ditches or canals into which the V-ditches drain. The large ditches may also receive drift as well as contaminated water from the V-ditches, but the concentration in the large ditches probably would never equal that in the V-ditches, because the depth of the water in the large ditches is greater than that in the V-ditches. The maximum concentration of alachlor in the V-ditches in 1979 of about 2.7 ppm (2689 ng/ml) was approximately 40% of the LD_{50} in 96 hr for catfish (Weed Sci. Soc. Amer. 1979). Dilution by mixing the contaminated water with uncontaminated water would further reduce the concentration of pesticide in the large ditches so that the concentration at the point of discharge into receiving streams would be considerably less than the maximum found for water in the V-ditches and the potential hazard to aquatic organisms would be concomitantly less.

In view of the possibility that some other organisms that inhabit such sites might be more susceptible to alachlor than catfish and that some pesticides are more toxic to organisms than alachlor, it appears that some hazard exists in ecologically sensitive areas which the experimental sites represent. Most likely, more diligence and care during application would greatly reduce or even eliminate significant hazard caused by drift. Transport in surface runoff, especially alachlor, does not appear to be sufficient to pose a significant hazard to aquatic life.

Soil Properties

The measured values of bulk density, apparent porosity, apparent particle density, and shrinkage percentage are given in Table 44 for both developed and undeveloped sites for all three soils.

The results show that bulk density decreases with depth in the deep colloidal organics for both developed and undeveloped cases. However the bulk density is considerably higher in the upper layers of the developed soil than for the corresponding depths of the undeveloped soil. For example, the bulk density of the surface layer of the developed soil was 2.2 times higher than the surface layer of the undeveloped. The bulk density of the deeper layers was not affected very much by the clearing and development operations and is nearly the same for both sites.

The changes in bulk density caused by the development of the shallow organic and mineral soils followed the same trend as observed for the deep colloidal organic. However, the percentage increase of bulk density due to development was smaller than for the deep organic sites because of a higher mineral content of these soils. The bulk density of the surface layer of the mineral soil increased by 18% due to development. For both the shallow organic and mineral soils the organic matter content decreases and the bulk density increases with depth (Table 44) for both developed and undeveloped sites. Note that the bulk density at the 25 and 55 cm depths of the shallow organics is considerably higher on the developed than on the undeveloped sites. This difference is attributed to the difference in organic matter content rather than compaction at that depth. The clearing operation removed and compacted the surface layer so that the soil at a depth of 25 cm on the developed site might have been 35 cm or more below the surface prior to clearing. Because the organic matter content changes rapidly at these depths for the shallow organic soil, this change of surface elevation is believed to be the cause of the differences in bulk density and organic content for this soil. The immediate effect of clearing and development on surface elevations is discussed in more detail in the following section.

The results of bulk density are in general agreement with results reported by Bel'skaya (1961) and Tomberg (1957) for changes due to drainage and reclamation of peat bog forest soils. However both investigators attributed the increase in bulk density to the decomposition of the peat

Table 44. Some soil physical properties on developed and undeveloped sites. Values in () are standard deviations.

Soil	Depth cm	Bulk Density		Porosity		Shrinkage Percent		Organic Matter Percent	
		Undeveloped gm/cc	Developed gm/cc	Undeveloped cc/cc	Developed cc/cc	Undeveloped	Developed	Undeveloped	Developed
Deep organic sites 103 and 104	0-8 cm[1]	0.164 (.003)	0.36 (.02)	0.87	.84	64 (4.7)	24 (.62)	93 (1.3)	82.3 (1.25)
	18-25	0.14 (.01)	0.23 (.008)	0.81	.86	71 (7.5)	51 (1.4)	84 (3.5)	
	28-40	0.13 (.002)	.168 (.004)	0.89	.97	81 (1.5)	80 (.74)	88 (7.2)	57.0 (14.64)
Shallow organic sites 106 and 107	0-8[1]	0.25 (.027)	0.38 (.023)	0.77	.72	60 (4.6)	41 (13.5)	86 (5.9)	73 (7.2)
	25-32	0.26 (.043)	0.39 (.036)	0.81	.77	70 (5.6)	48 (8.9)	74 (8.9)	55 (2.5)
	55-63	0.52 (.097)	0.91 (.010)	0.72	.62	33 (3.8)	16 (1.3)	37 (.033)	9 (.6)
	112-120	1.61 (.036)	1.65 (.004)	0.36	.37	1.2 (1.2)	1.5 (.52)	3 (.8)	3 (.6)
Mineral-histic epipedon sites 101 and 102	0-8[1]	0.51 (.053)	0.60 (.045)	0.70	.76	29 (4.6)	16 (1.6)	30.7 (8.9)	27 (1.43)
	15-23	1.1 (.085)	1.1 (.083)	0.60	.55	2.8 (1.93)	11.3 (3.20)	11 (5.27)	8.2 (1.48)
	50-58	1.63 (.045)	1.6 (.042)	0.42	.43	1.4 (.805)	4.5 (1.03)	1.9 (.62)	1.1 (.08)

[1] The surface samples for the undeveloped sites did not include 10 to 45 cm of leaves, twigs, and other organic accumulation. This layer of material was removed before the sample was taken.

due to drainage rather than to clearing and compaction processes which are considered important in the results presented here.

The total porosity was assumed equal to the measured saturated water content. In the deep colloidal soils, the total porosity increased with depth; whereas while on the mineral and shallow organic sites, both developed and undeveloped, it decreased with depth because of a decrease in organic matter content with depth. The results given in Table 44 show a tendency of the upper layers to have somewhat lower porosities in the developed sites than in the undeveloped sites. This is due to the higher bulk densities because of root clearing and compaction as discussed above. As expected the differences in total porosity of deep layers of developed and undeveloped sites was small for all three soils. There were some differences in porosities of the middle layers of the developed and undeveloped shallow organic soils because of differences in organic matter content as discussed above. Again the results for total porosity agrees with those reported by Bel'skaya (1961) and Tomberg (1957). They reported that, following reclamation and cultivation, the bulk density of peat increases more than its specific gravity, therefore the total porosity decreases.

Shrinkage due to drying was much higher in the surface layer of the undeveloped sites than in the surface layer of the developed sites for all three soils. This is due to the fact that the surface layer of the developed sites had already been exposed to evaporation and had at least partially dried or cured irreversibly. Thus, the solid matter had concentrated resulting in higher bulk densities and less shrinkage when the samples were dried.

A summary of the measured saturated hydraulic conductivity values of both developed and undeveloped sites on all three soil types is given in Table 45. As expected, K values of the deeper layers are about the same for developed and undeveloped sites. These hydraulic conductivities were very low for all three soils with values ranging from about 0.01 cm/hr for the clay layer under the shallow organic soils to 0.09 cm/hr for the deep colloidal muck soils. The surface layers had higher conductivities than deeper layers for all soils, both developed and undeveloped. Because of the lower bulk density, the surface layers of the undeveloped sites had higher K values than the developed sites. However, the differences were less than the differences in K between the various layers on any of

Table 45. Saturated hydraulic conductivity of developed and undeveloped soils.

Location	Sample depth (m)	Saturated hydraulic conductivity cm/hr Undeveloped	Developed
			Site 100
Deep organic (Sites 103 and 104)	0.01 - 0.15	28.51 (31)*	4.12
	0.25 - 0.40	0.42 (0.24)	0.03
Shallow organic (Sites 106 and 107)	0.0 - 0.14	90.5 (20.5)	18.3 (8.09)
	0.24 - 0.40	0.35 (.005)	
	0.45 - 0.55		0.05 (.02)
	1.10 - 1.20	0.005 (.005)	0.013 (.008)
Mineral with histic epipedon (Sites 101 and 102)	0.0 - 0.15	14.4 (10.3)	7.4 (1.6)
	1.10 - 1.20	0.99 (0.1)	0.11 (.016)

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*Values inside () are standard deviations.

the soils. These results are in contrast with those reported by Getov (1958). He reported an increase in permeability of layers near the surface due to drainage that improved aeration and caused fissure and cracks in the soil profile. The changes in hydraulic conductivity in this study are due to both land development and drainage.

Special attention should be given to the surface mat on the undeveloped sites. This mat, which is not present in developed sites, varies in thickness from 10 to 45 cm and is composed of leaves, twigs, roots and partially decomposed organic matter. Lab measurements for hydraulic conductivity were conducted on samples taken from this mat. The hydraulic conductivity was very high (986 cm/hour) for samples from site 104 and 485 cm/hour for site 107. Although properties of the surface mat are not represented in Tables 44 and 45 the mat has an important influence on the hydrology of undeveloped areas.

The drainage branches of soil water characteristics for developed and undeveloped sites of the three organic soils are plotted in Figures 34-36. Except for the surface layer, there was very little difference in the soil water characteristics of the developed and undeveloped sites for both the mineral (Figure 34) and shallow organic (Figure 35) soils. The more porous surface layers of the undeveloped soils release more water at lower tensions than the corresponding layers for developed sites on both soils.

The biggest difference in the soil water characteristics is in the deep colloidal organic soils (Figure 36). Except for the surface layer, the soil water in all layers of the undeveloped soil (site 104) is released at lower tensions than in the corresponding layers of the developed site 103. This would be expected from a comparison of the bulk densities of these soils (Table 44). The soil on the developed site has a higher bulk density even at the 0.4 m depth than the undeveloped soils.

The relationships between drained volume (water yield) and water table depth are plotted for developed and undeveloped sites for all three soils in Figure 37. Drainable porosities were obtained as the slopes of the relationships plotted in Figure 37, and are given for three water table depth increments in Table 46. The drainable porosity for the deep colloidal muck soils was higher in the developed than in the undeveloped sites for water table depths less than 0.6 m but lower for greater water table depths.

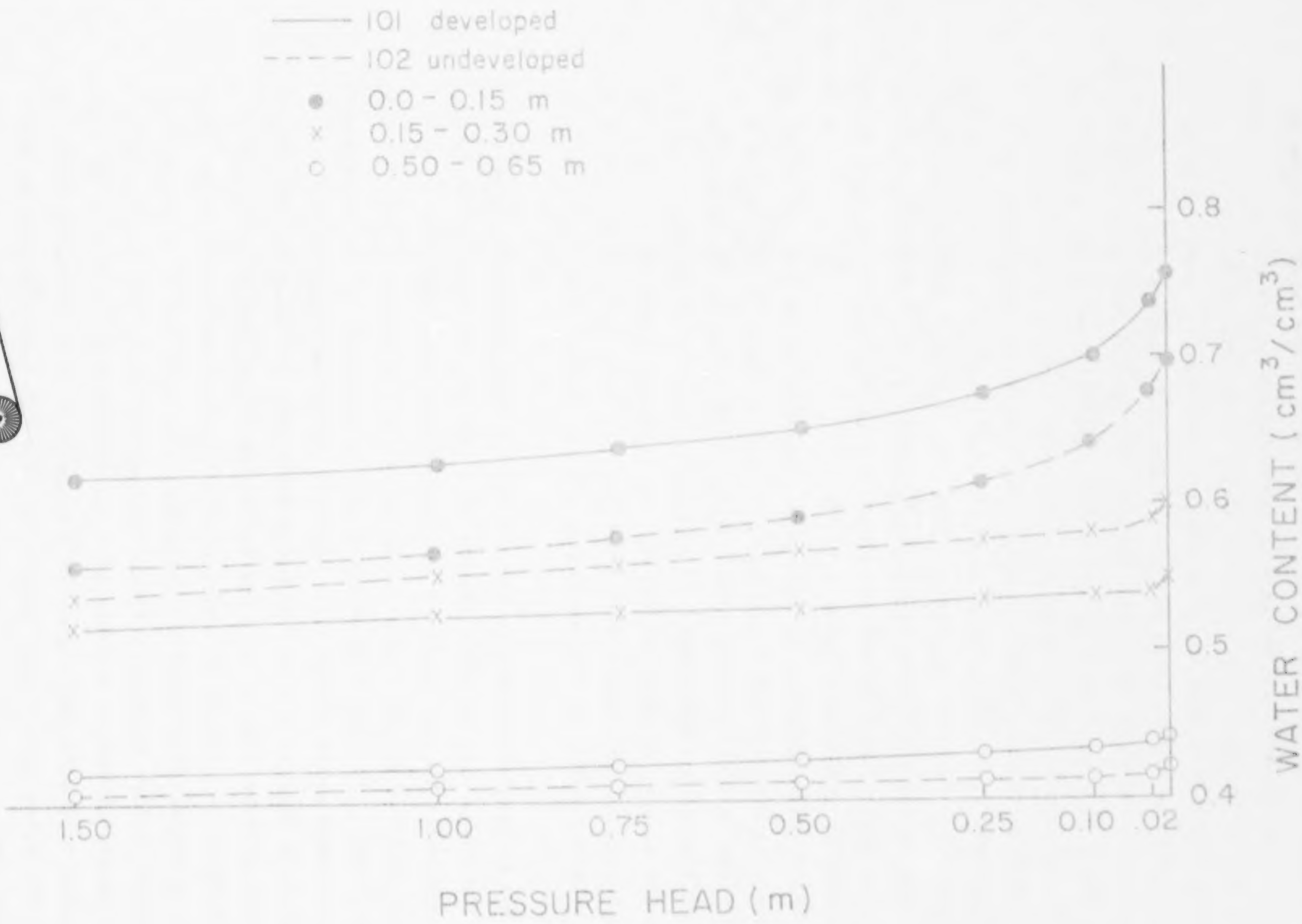

Figure 34. Drainage branches of soil water characteristics of the mineral soils for both developed and undeveloped sites.

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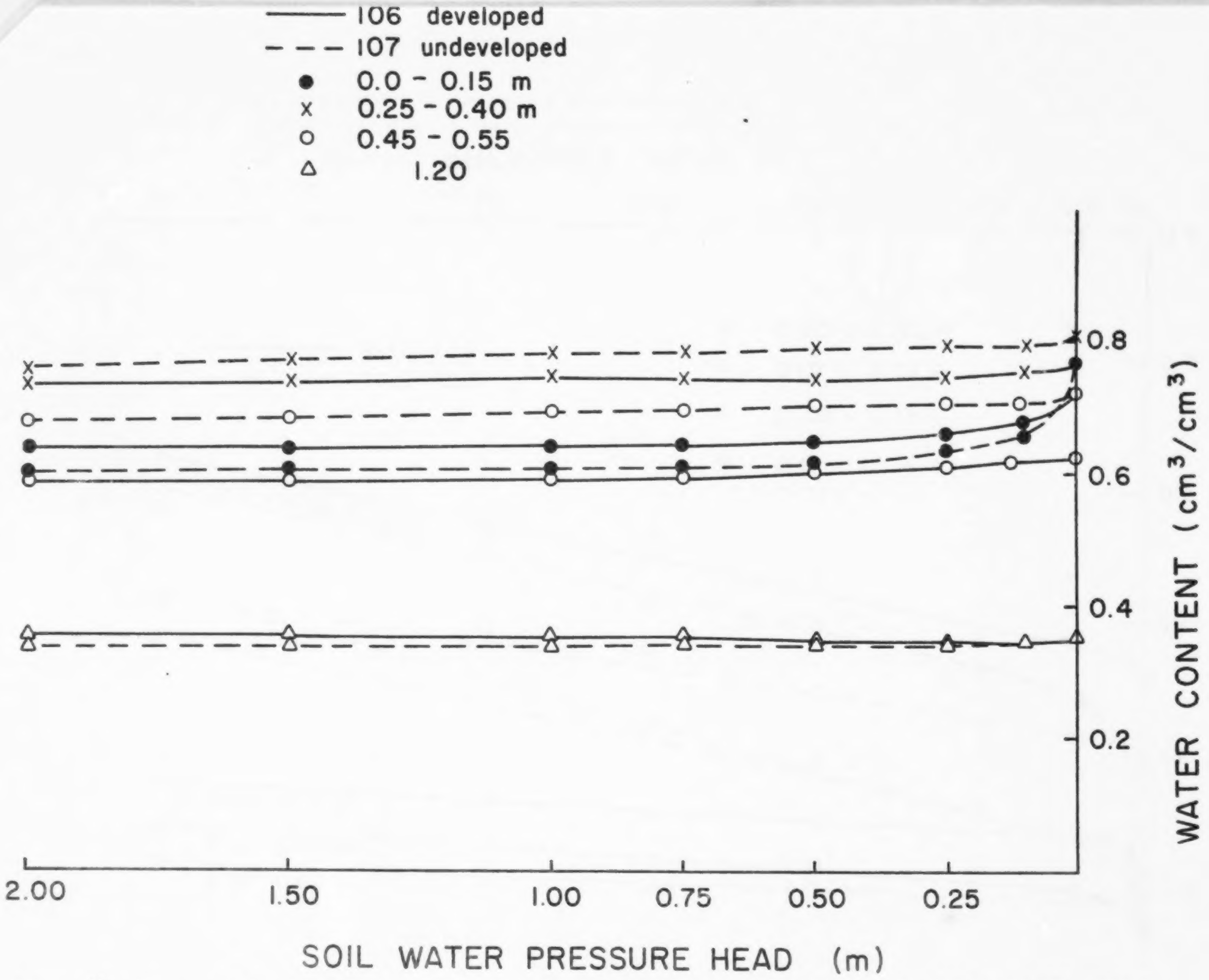

Figure 35. Drainage branches of the soil water characteristics at 4 depths of the shallow organic soils for both developed and undeveloped sites.

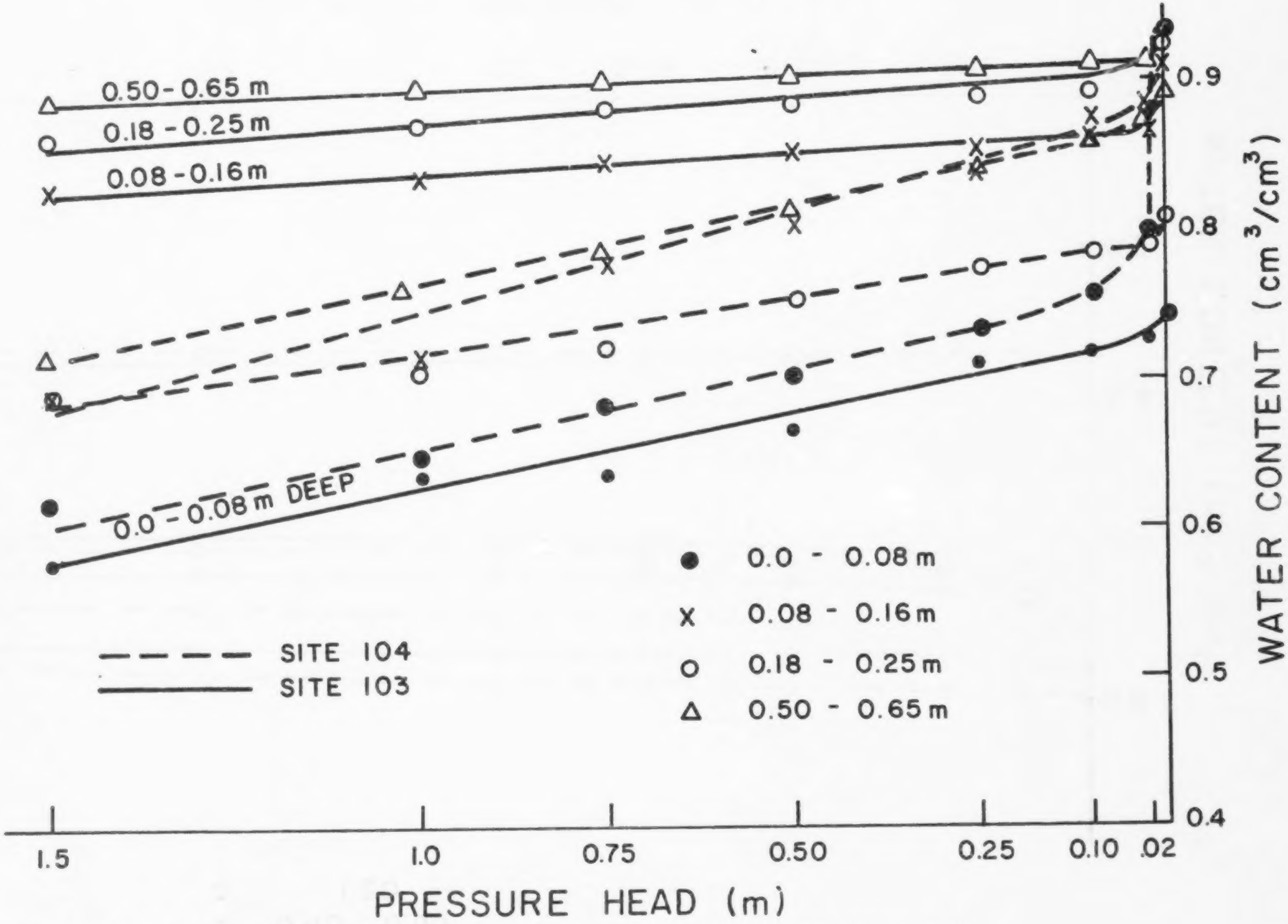

Figure 36. Drainage branches of soils water characteristics on the developed and undeveloped sites of the deep organic soil.

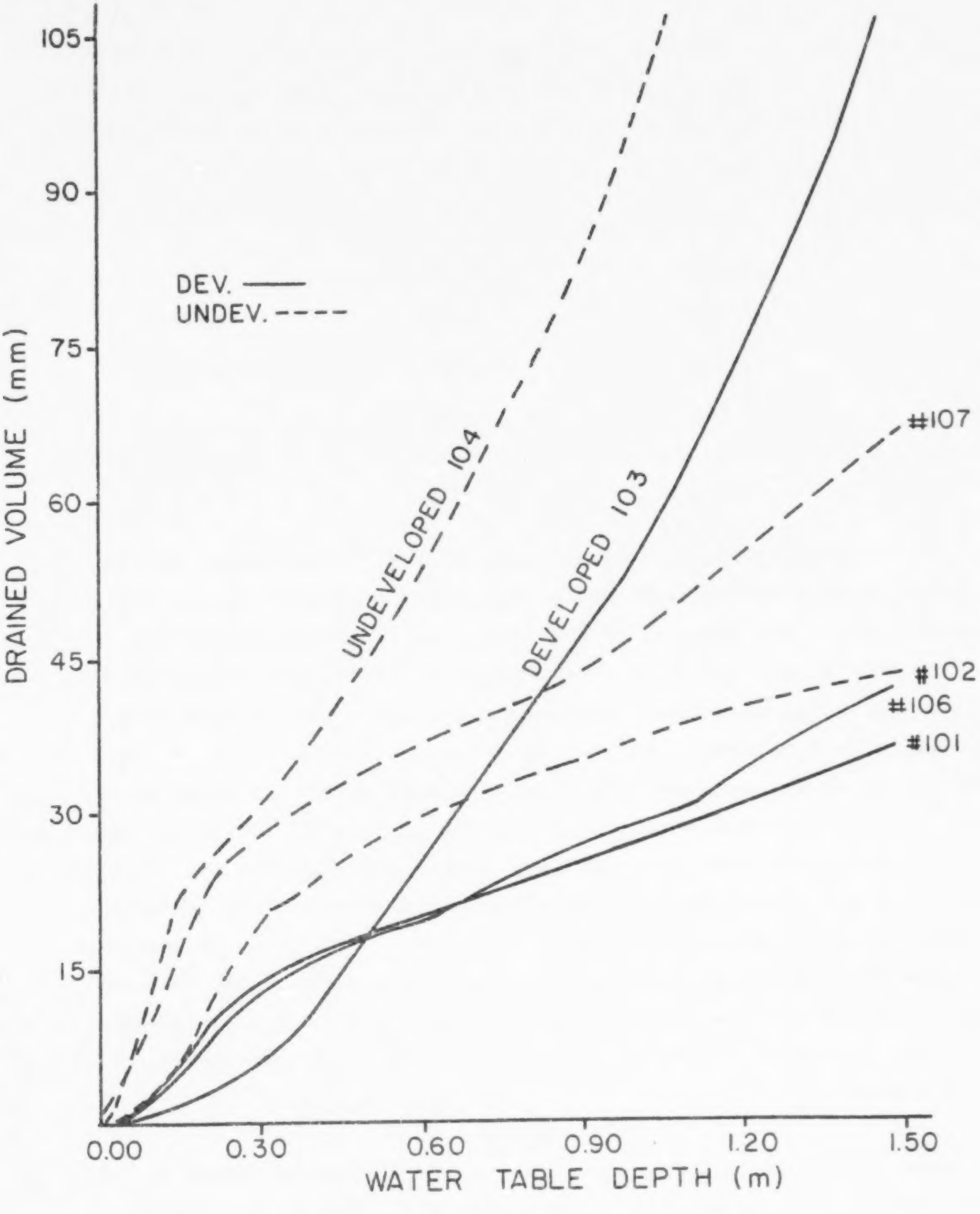

Figure 37. Water yield relationships for developed and undeveloped mineral (101 and 102), shallow organic (106 and 107) and deep organic (103 and 104) profiles.

Table 46. The drainable porosity for three water table depth increments for all sites.

Site	Depth in m		
	0.0 - 0.30	0.30 - 0.60	0.6 - 1.5
103	0.022	0.06	0.093
104	0.103	0.07	0.13
101	0.044	0.022	0.018
102	0.064	0.033	0.016
106	0.042	0.022	0.025
107	0.042	0.022	0.025

The drainage volume at a given water table depth was higher in the undeveloped than the developed sites for both the shallow organic and the mineral soils. For example, 17 mm of water must be removed from the profile by drainage and ET to lower the water table from a depth of 0.3 m to 0.6 m on the undeveloped shallow organic (site 107 - Figure 37); whereas, only 7 mm need to be drained to lower the water table by the same amount on the developed site (106). The relationships given in Figure 37 indicate that water table response to rainfall, ET and drainage would be greater in the developed than in the undeveloped sites. This is consistent with field observations of water tables which have greater fluctuation in developed than undeveloped sites. Finally it is emphasized again that characterization of the water yield relationship does not include the root mat on the undeveloped sites. The mat is very porous and large amounts of water may be required to raise or lower the water table therein.

Soil Subsidence

Results of surface elevation surveys to determine subsidence on the deep organic soil are plotted for one transect in Figure 38. Recall that the site was in pasture for the duration of the study. Note that the surface elevation decreased at some points in the field and increased in others. This is caused by soil movement due to animal

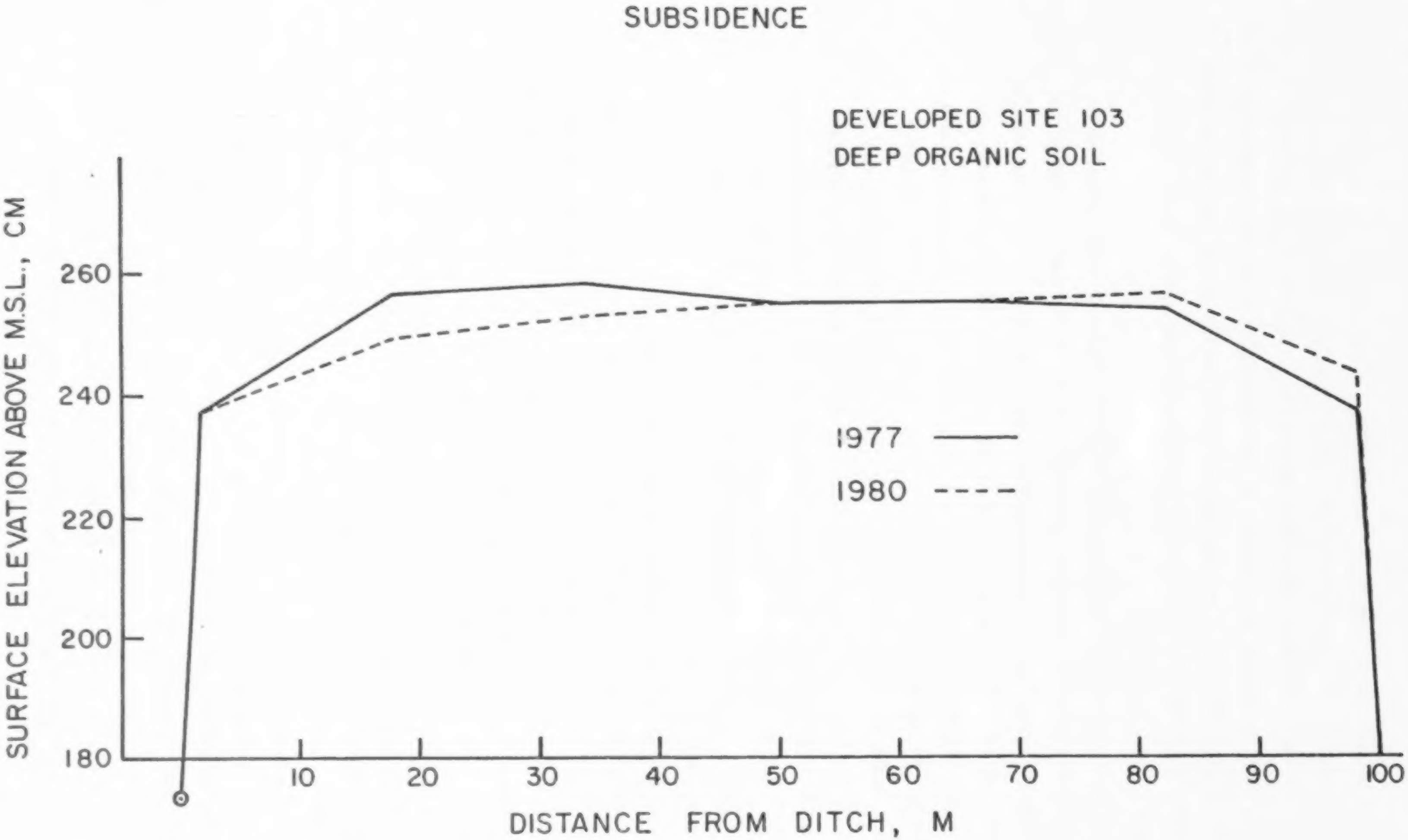

Figure 38. Soil subsidence as indicated by surface elevations for 1977 and 1980 on the developed deep organic pasture site.

traffic, wind and surface runoff. Generally, points near the center of the field decreased in elevation while the elevation near the field ditches, and in the ditches, increased slightly. The average surface elevation for the transect in Figure 38 decreased by 0.43 cm in three years (7-12-77 to 6-10-80). Measurements at a total of 35 points on five transects gave an average decrease in surface elevation of 0.20 cm in three years, or 0.07 cm/year.

The subsidence value obtained for the deep organic soil represents the cumulative effects of erosion, compaction and biochemical oxidation. It is very small compared to measurements reported in the literature for other organic soils. For example, Stephens (1969) reported subsidence measurements at Belle Glade, Florida ranging from 1.5 cm/year for water table depths of 30 cm to 5.8 cm per year for water tables 90 cm below the surface. However these soils are fibrous peats with relatively large pores throughout the profile. The saturated hydraulic conductivities are high and they are much better drained than the organic soils in this study. Also the pH throughout the profile of the Florida organics is higher (5 to 6) enabling more active microbial decomposition of organic matter.

A thorough study of subsidence on low moor peat soils in the Netherlands was presented by Schothorst (1977). He found that lowering the water table by 0.5 m (from a depth of about 0.3 m to about 0.8 m) on grass lands used for pasture resulted in subsidence of about 6 to 10 cm over a 6 year period. Of this, 65% was ascribed to shrinkage and oxidation and 35% to compression on the layer below the water table. Schothorst noted that the general opinion of scientists in the Netherlands is that subsidence of peat soils under permanent grass cover occurs mainly through decreasing volume by shrinkage. Oxidation was not regarded as important for peat soils with shallow water tables under grass cover. However, Schothorst (1977) attributed loss by oxidation on soils with bulk densities of 0.2 g/cm^3 to account for 0.2 cm/year on soils with shallow water tables and 0.6 cm/year after 0.5 m deeper drainage. The bulk density in the surface layer of our deep organic site was 0.36 g/cm^3 (Table 44) and the hydraulic conductivity is much smaller than the 12 to 16 cm/hr (c.f. Table 45) of the Netherlands study. Thus the measured value of 0.07 cm/year for our site does not seem inconsistent with the results of Schothorst when differences in the organic material and water table depth are considered.

The study was initiated, and the first surface elevation measurements made on the deep organic site, two or more years after the site was developed for pasture. An earlier study (Skaggs and Barnes, 1976) on a nearby site showed subsidence of 2.7 cm/year for the first two years after development. After that initial period of rapid change, subsidence essentially ceased. This suggests that the primary mechanism for subsidence on these poorly drained, colloidal organic soils is shrinkage due to irreversible drying of the surface layers directly following development. Badr (1978) found that irreversible drying caused shrinkage of the surface layer of 64% of the original volume. That is, the ratio of the final dry volume to the initial wet volume was 0.36. The root mat and surface cover is removed during development exposing the surface soil to drying processes. The surface horizon or root zone gradually dries or cures the first one or two years after development. The surface soil shrinks and its elevation subsides during this process; its properties change as it dries irreversibly. Soil below the root zone is not exposed to strong drying forces as the root depth is restricted by the very low pH of the subsoil. Thus the only rapid rate of subsidence on the organic soils in permanent pasture will occur in the first one or two years after development. Our measurements on site 103 occurred after the initial shrinkage had taken place.

Subsidence measurements on the developed mineral (101) and shallow organic (106) sites were difficult to interpret because the fields were reshaped and graded during the course of the study. Nevertheless, final elevation measurements were made and average subsidence values were determined. These values are summarized in Table 47. The average surface elevation of the shallow organic site decreased by 3.37 cm during the three year period from 1977 to 1980. Most of this change probably occurred when the field was reworked during Jan. - March, 1979. At that time, additional buried wood was removed from the profile and piled in the windrows in the center of the field, which also contained remains of surface vegetation and buried wood that had been removed when the site was initially cleared. The windrows were burned, along with some of the organic soil, and the fields were reshaped and graded. The soil surface

Table 47. Average subsidence for the experimental sites during the three year study.

Site	Date of initial survey	Date of final survey	Number of points	Average subsidence (cm)	Subsidence rate (cm/year)
Developed deep organic (103)	7-12-77	6-10-80	35	0.20	0.07
Developed shallow organic (106)	7-12-77	6-10-80	24	3.4	1.1
Developed mineral (101)	11-9-78	6-10-80	76	-3.1	-1.6
Undeveloped mineral (102)	7-12-77	6-1-80	10	7.0	2.3

would have subsided by the volume of wood that was removed and burned. The grading and shaping process, as well as the conventional cultivation practices during farming, exposed more of the wet organic subsoil to drying. This would have caused additional subsidence as shrinkage would have occurred as the soil dried irreversibly.

The average surface elevation on the developed mineral site actually increased by 3.1 cm from 1978 to 1980. Here again the change was due to shaping and grading work during the winter and spring of 1979. The windrow that was pushed up when the site was cleared and developed in 1977 contained a considerable amount of soil that had an organic matter content of only about 30% by weight (Table 44). When the wood in the windrow was burned in 1979, the remaining soil was spread over the site, potholes were filled and the site was regraded. Soil may have also been moved into the areas of our transects from other locations on the site. The result showed an increase in the surface elevation rather than the expected decrease. In any case subsidence on this site is expected to be small. The organic matter content of the surface soil is the lowest of any of the sites and shrinkage is also low (29%) compared to the other sites.

The timber had been cut and removed from the undeveloped mineral site 102 when the last survey was made on 6-12-80. The average surface elevation was 7.0 cm lower than that measured on 7-12-77. Most of this difference is assumed due to compaction that took place during the harvesting and logging process. Subsidence measurements on undeveloped deep and shallow organic sites were inconclusive because of the difficulty of defining the interface between the root mat and the soil surface.

Surface elevation profiles for fields near site 106 in various stages of development are plotted in Figure 39. Note that these are adjacent fields, not the same field at different stages of development. The overall field topography after the timber is removed is nearly flat (Figure 38a). There are a few holes and some high points, such as next to the ditch where the spoil has been deposited, but the overall profile is flat. The next stage is to push the surface vegetation into a windrow midway between the ditches (Figures 38b and d). Stumps and some buried wood may be removed in the process. This is the first stage in sloping the field toward the ditches. Next a root rake is used to remove the remainder of the stumps and as much buried wood as possible. Dozers are used to slope the surface toward the ditches. The amount of slope varies but is usually between 0.3 to 0.5%. The land is then bedded, to provide good drainage in the immediate vicinity of the plant roots, and planted (Figure 38c). Depending on the time of year that the land is cleared, the windrow may be burned prior to shaping the field or it may remain for one or two years of farming. In the interim, additional buried wood may be extracted from the profile and added to the windrow. Then the windrow is burned or otherwise disposed of, surface depressions are filled and, in some cases, the field may be reshaped to improve surface drainage. This process may be repeated in following years as land development is a continual process that occurs over a long period of time.

An elevation profile of a field (near site 106) eight years after it was initially cleared and developed is plotted in Figure 40. The average slope from the middle of the field to the ditch for this field is about 0.7%, which is somewhat larger than the 0.25 to 0.5% normally used in the

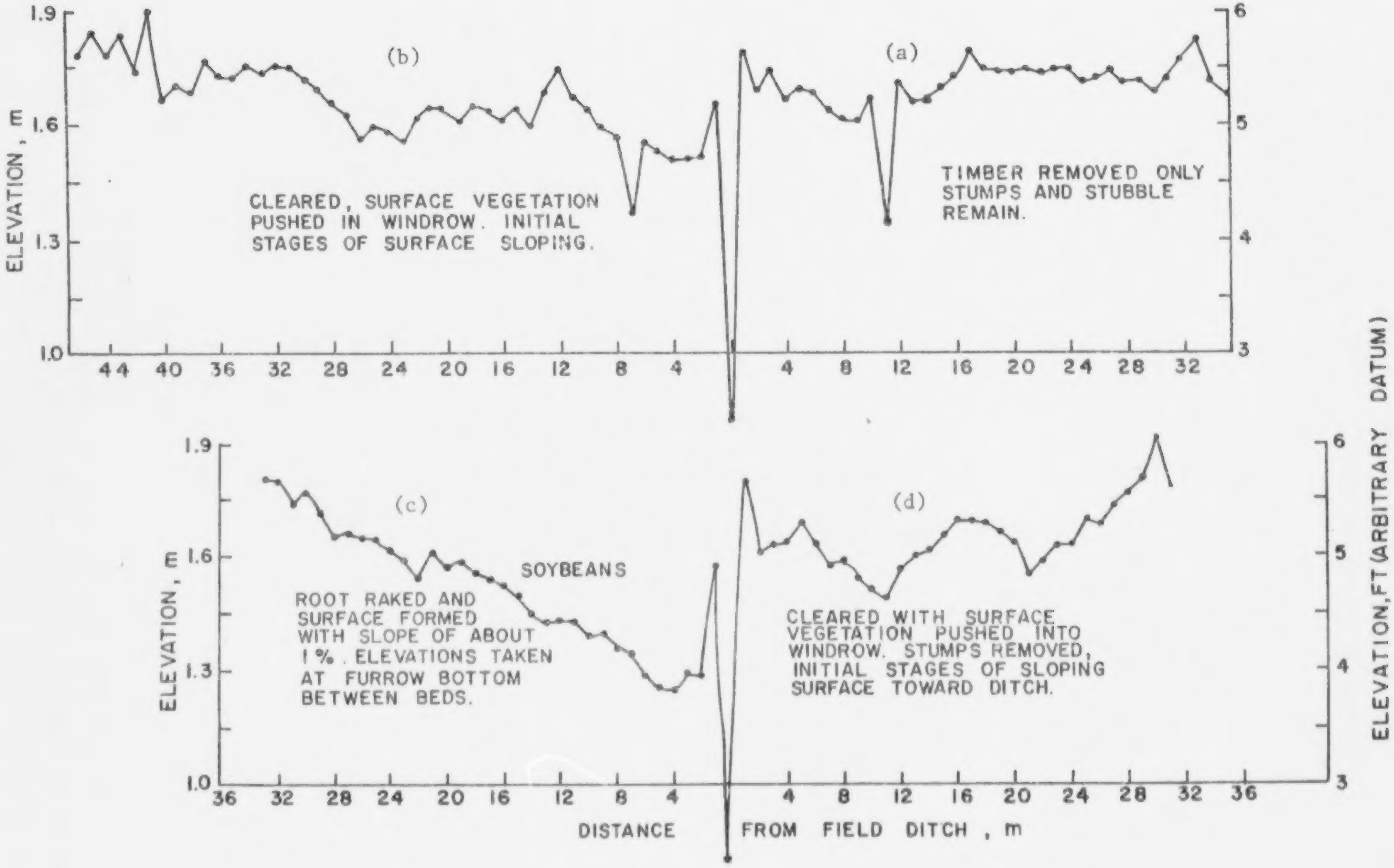

Figure 39. Elevation profiles for shallow organic fields near site 106 at various stages of development.

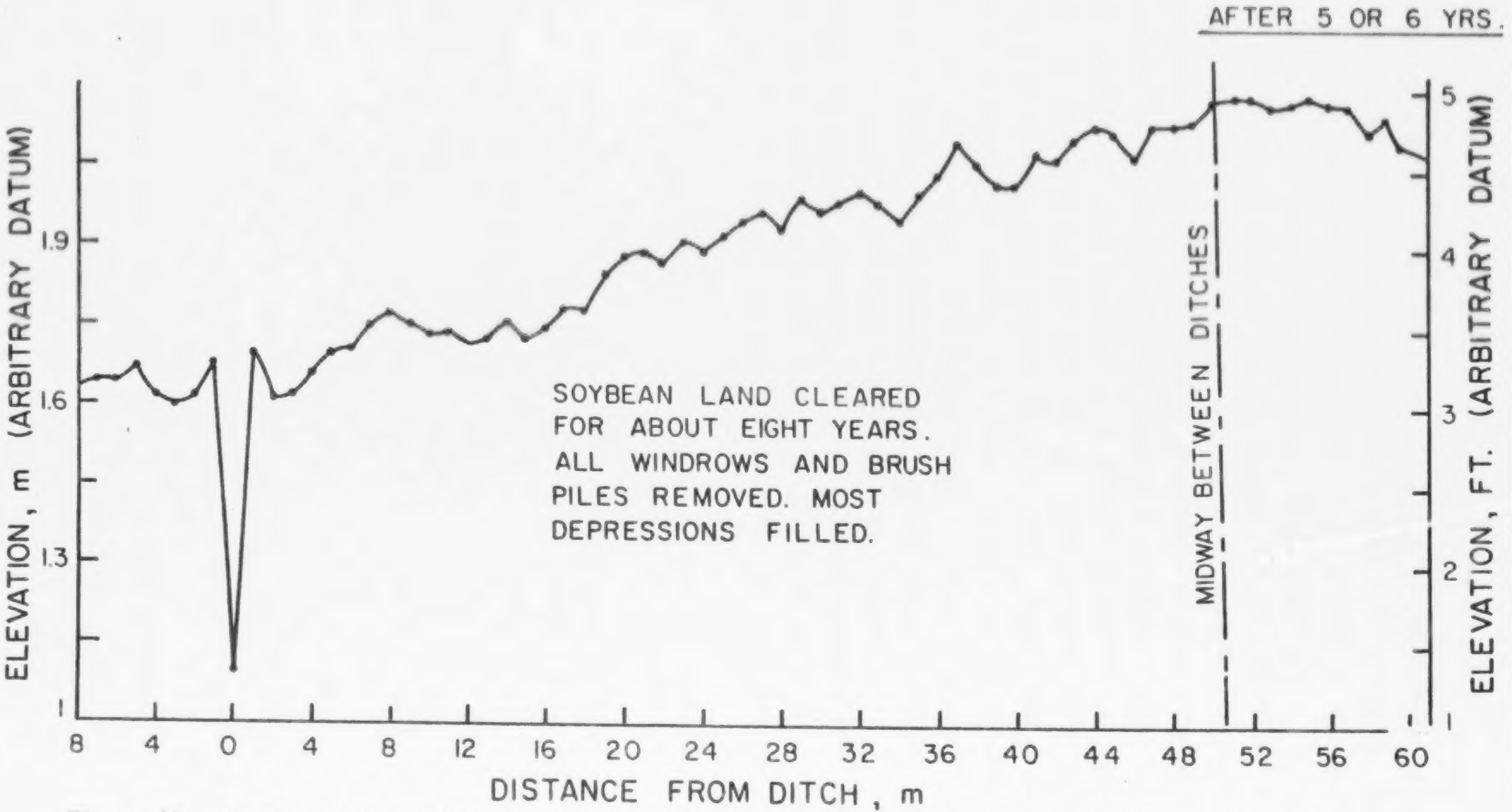

Figure 40. An elevation profile of a developed shallow organic soil eight years after clearing.

Tidewater region. All of the operations discussed above affect surface roughness and elevations and the profiles are presented to show the effects of the operations at various stages of development.

Vertical Gradients of Hydraulic Head

Piezometers at 3.0, 6.1, 9.1 and 12.2 m (10, 20, 30 and 40 ft) were read periodically during the study. A drill rig was required to install the piezometers so it was necessary to place them in an accessible location near the end of the sites. Thus, their locations, in all cases except 103, were within 30 to 40 m of a collector canal or a main drainage canal. Piezometer readings for the 6.1, 9.1 and 12.2 m depths are tabulated in Appendix C. The 3.0 m piezometers gave erratic readings on all sites except 102 and 104 and are not given. Except for site 103 where recorders were placed on the 6.1 and 12.2 m piezometers, there were insufficient data to draw general conclusions about the magnitude and direction of the gradients during different seasons of the year. A summary of the average values is given in Table 48. Average gradients are also presented in Table 48. Gradients in the upward direction are negative and those in the downward direction positive.

Table 48. Summary of average depth from soil surface to water in piezometers (cm).

Site	Piezometer Depth			Average Gradients			Flux*
	6.1 m	9.1 m	12.2 m	6 m-9 m	9 m-12 m	6 m-12 m	cm/yr
102	112	91	102	-0.068	0.036	-0.016	-1.6
103	101	85	108	-0.052	0.076	0.008**	0.84
104	98	102	98	0.013	-0.013	0.0	0.0
106	65	63	-	0.0065	-	-	0.54
107	129	126	119	-0.0098	-0.022	-0.016	-1.6

[*] Flux calculations are based on as assumed hydraulic conductivity of 0.28 cm/day.

[**] Based on continuously recorded piezometer water levels during 1978 and 1979.

The piezometric heads, referenced to mean sea level (M.S.L.), for depths of 6.1 and 12.2 m at site 103 are plotted in Figure 41 for 1978. Similar results were obtained for 1979. These results show that the piezometric heads at both depths closely follow the fluctuations in the water table elevation (c.f. Figure 17), rising during wet periods and falling during dry periods in the autumn. The piezometric or hydraulic head at the 6.1 m depth was nearly always higher than at 12.2 m. However, the difference was small with an average hydraulic head for the year only 5 cm higher at the 6 m depth than at the 12 m depth. This gives an average downward gradient of 0.008 cm/cm. Using a hydraulic conductivity value of K = 0.28 cm/day obtained by Daniels et al. (1978) for similar sediments, a downward seepage of 0.84 cm/year is estimated. These results are confounded somewhat by piezometer readings at the 9.1 m depth. The water level in this piezometer was not recorded, but, based on periodic readings (Table 48), the gradient from the 6 to 9 m depth were in the upward direction and that for the 9 to 12 m depth in the downward direction. This would imply lateral water movement into the zone between the 6 and 12 m depth. However the differences in the piezometer readings were small and the changes in the gradient direction could have resulted from experimental error. The ends of the piezometers are set in sediments with different hydraulic conductivities so the time required for the piezometer to fill after a change in head could be a cause of error in the results.

Average values for gradients from the 6 m to 9 m and 9 m to 12 m depths were also in different directions for sites 102 and 104. The gradients were in the upward direction for all depth increments on site 107. Vertical fluxes were estimated from the overall gradient between the 6.1 and 12.2 m depths using the K value of 0.28 cm/day. These values ranged from 1.6 cm/year in the upward direction to 0.84 cm per year downward. These values are in reasonable agreement with the 0.86 cm/year estimate by Heath (1975).

While our results are not sufficient to quantify vertical seepage for the many varied conditions in the area, vertical seepage is believed to be small for the soils in this area. The soil profiles as described in Appendix A are all underlain by the Yorktown formation. This formation has tight clay and silty clay layers of low hydraulic conductivity

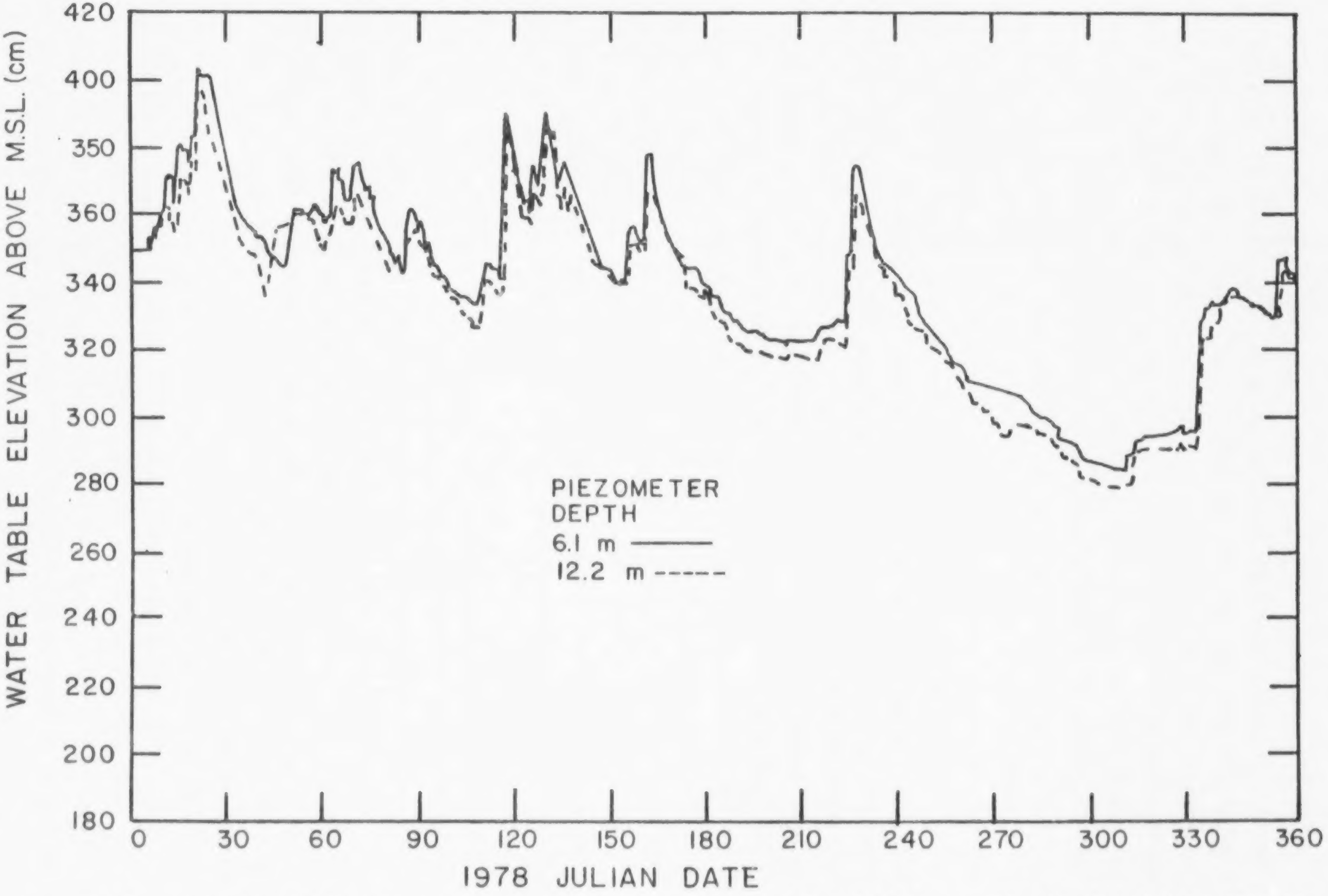

Figure 41. Water level elevations in piezometers at depths of 6.1 and 12.2 m on the developed deep organic site (103) during 1978.

(Daniels et al., 1975) that would restrict vertical water movement probably more than the layers closer to the surface. Daniels et al. (1978) argued that groundwater movement, or lack of movement, is clearly indicated by the color of the underlying sediments. They present several lines of evidence to show that sediments with gley colors, such as those described in Appendix A for our sites, are in zones of very limited water movement.

LITERATURE CITED

Badr, A. W. 1978. Physical properties of some North Carolina organic soils and the effect of land development on these properties. M. S. Thesis, Department of Biological and Agricultural Engineering, N. C. State University, Raleigh, N.C., 66pp.

Ball, D. F. 1964. Loss-on-ignition as an estimate of organic matter and organic carbon in non-calcareous soils. Soil Science, 15:84-92.

Bel'skaya, M. A. 1961. Changes in the physical properties of peat-bog forest due to drainage. Leningradskii Nauchno-Issledovatel'skii Institut Lesnogo Khozyaistva. Sbornik Rabot po Lesnomu Khozyaistvu 4. Translated from Russian, IPST Cat. No. 1984.

Blake, G. R. 1965. Bulk density measurements. Ch. 30 In. C. A. Black (Editor), Methods of Soil Analysis. Agronomy Monograph No. 9:374-390. American Society of Agronomy, Madison, Wis.

Boelter, D. H. 1972. Methods for analyzing the hydrological characteristics of organic soils in March-Ridden areas. Proceedings of UNESCO Symposium, Minsk, Belorussian SSR. June 1972.

Bormann, E. Herbert and Gene E. Likens. 1970. The nutrient cycles of an Ecosystem. Soil Sci. Soc. Am. Proc. 223:92-191.

Daniels, R. W., J. W. Gilliam, E. E. Gamble, and R. W. Skaggs. 1975. Nitrogen movement in a shallow aquifer system of the North Carolina Coastal Plain. Water Res. Bull. 11:1121-1130.

Daniels, R. B., E. E. Gamble, W. H. Wheeler, J. W. Gilliam, E. H. Wiser, and C. W. Welby. 1978. Water movement in surficial Coastal Plain sediments, inferred from sediment morphology. Tech. Bul. No. 243, North Carolina Agricultural Exp. Sta., 33pp.

Daughtrey, Z. W., J. W. Gilliam, and E. J. Kamprath. 1973. Soil test parameters for assessing plant-available P of acid organic soils. Soil Science. 115:438-446.

Dolman, J. D. and S. W. Buol. 1967. A study of organic soils (Histosols) in the Tidewater Region of North Carolina. Tech. Bul. No. 181.

Duxbury, J. M. and J. H. Peverly. 1978. Nitrogen and phosphorus losses from organic soils. J. Environ. Qual. 7:566-570.

Fisher, D. W. 1968. Annual variations in chemical composition of atmospheric precipitation in eastern North Carolina and southeastern Virginia. U. S. Geological Survey Water Supply Paper 1535M.

Fox, R. L. and E. J. Kamprath. 1971. Adsorption and leaching of P in acid organic soils and high organic matter soil. Soil Sci. Soc. Am. Proc. 3:154-156.

Gamble, A. W. and D. W. Fisher. 1966. Chemical composition of rainfall in eastern North Carolina and Virginia. Geological Survey Water Supply Paper 1535K.

Gambrell, R. P., J. W. Cilliam, and S. B. Weed. 1974. The fate of fertilizer nutrients as related to water quality in the North Carolina Coastal Plain. Water Resources Research Institute of the University of North Carolina. Report No. 93.

Getov, L. V. 1958. The changes in the water permeability of peat bog soils resulting from drainage. Trudy Belorusskogo Nauchno-Issledovatel'skogo Instituta Melioratsii i Vodnogo Khozyaistva, No. 8:313-327. Translated from Russian. IPST Cat. No. 661.

Gilliam, J. W. 1971. Rapid measurement of chlorine in plant materials. Soil Sci. Soc. Am. Proc. 35:512-513.

Gilliam, J. W., R. W. Skaggs, and S. B. Weed. 1978. An evaluation of the potential for using drainage control to reduce nitrate loss from agricultural fields to surface waters. Water Resources Research Institute of the University of North Carolina. Report No. 128.

Harrison, W. G. and J. E. Hobbie. 1974. Nitrogen budget of a North Carolina estuary. Water Resources Research Institute of the University of North Carolina. Report No. 86.

Heath, R. C. 1975. Hydrology of the Albemarle-Pamlico Region of North Carolina. USGS Water-Resources Investigations 9-75, prepared in cooperation with NCDNER. USGS, Raleigh, N.C. 98pp.

Hendry, C. and P. L. Brezonik. 1976. Atmospheric inputs to cypress domes. *In*. H. T. Odum and K. C. Ewel (Principal Investigators), Cypress Wetlands for Water Management, Recycling, and Conservation. Third Annual Report to National Science Foundation and the Rockefeller Foundation. Univ. of Fla., Gainesville, Fla.

Hobbie, John A. 1974. Nutrients and eutrophication in the Pamlico River estuary, N.C. Water Resources Research Institute of the University of North Carolina. Report No. 100

Holtz, W. G. 1975. Volume change measurements. In C. A. Black (Editor), Methods of soil analysis. Agronomy Monograph No. 9:448-465. American Society of Agronomy, Madison, Wis.

Hortenstine, C. C. and R. B. Forbes. 1972. Concentration of nitrogen, phosphorus, potassium, and total soluble salts in soil solution samples from fertilized and unfertilized Histosols. J. Environ. Qual. 1:446-449

Horvath, G. J., R. C. Harriss, and H. C. Mathew. 1972. Land development and heavy metal distribution in the Florida Everglades. Marine Poll. Bull. 3:182-184.

Hunt, T. W. 1979. Residue studies with alachlor, ethoprop, and cyhexation on several horticultural crops. PhD Dissertation, N.C. State University, Raleigh, N.C. 71pp.

Kirby-Smith, William W. and Richard T. Barber. 1979. The water quality ramifications in estuaries of converting forest to intensive agriculture. Water Resources Research Institute of the University of North Carolina. Report No. 148.

Kuenzler, Edward J. and Patrick J. Mulholland. 1977. Water quality in North Carolina coastal plain streams and effects of channelization. Water Resources Research Institute of the University of North Carolina. Report No. 127.

Lilly, J. P. 1980. Blackland soils of North Carolina; their characteristics and management. Tech. Pub. in review in the Soil Science Department at N. C. State University, Raleigh, N.C.

Lowe, R. H. and J. L. Hamilton. 1967. Rapid method for determination of nitrate in plant and soil extracts. J. Agric. Food Chem. 15: 359-361.

Mallmann, W. L. and W. Litsky. 1951. Survival of selected enteric organisms in various types of soil. Am. J. Public Health. 41:38-44.

O'Rear, Charles W., Jr. 1975. The effects of stream channelization on the distribution of nutrients and metals. Water Resources Research Institute of the University of North Carolina. Report No. 108.

Robbins, J. W. D. 1978. Environmental impact resulting from unconfined animal production. U.S.E.P.A. 600/2-78-046.

Ruffin, Edward. 1861. Sketches of lower North Carolina and the similar adjacent lands. Institute for the Deaf and Dumb. Raleigh, N.C., N.C. State University. Microfiche No. 17, 243-17, 2469A.

Schnare, D. W., R. F. Christman, and F. K. Pfaender. 1979. Methods for the assessment of aqueous organic materials. Univ. of North Carolina Water Resources Research Institute Report No. 145, 90pp.

Schothorst, C. J. 1977. Subsidence of low moor peat soils in the western Netherlands. Tech. Bull. 102, Institute for Land and Water Management Research, Wageningen, The Netherlands. 265-291.

Sheets, T. J., J. R. Bradley, Jr., and M. D. Jackson. 1972. Contamination of surface and ground water with pesticides applied to cotton. Report No. 60, Univ. of North Carolina Water Resources Research Institute, Raleigh, N.C. 63pp.

Sheets, T. J. and J. Neal. 1979. North Carolina Agricultural Research Serv., Unpubl. results.

Skaggs, R. W. 1978. A water management model for shallow water table soils. Report No. 134, Water Resources Research Institute of the University of North Carolina, 124 Riddick, North Carolina State University, Raleigh, N.C.

Skaggs, R. W. and J. S. Barnes. 1976. Drainage and water table control on colloidal muck soils. ASAE Paper No. 76-2041. Presented at the 1976 Annual ASAE Meeting, Lincoln, Nebraska, 20pp.

Skaggs, R. W., L. G. Wells, and S. R. Ghate. 1978. Predicted and measured drainable porosities for field soils. Transactions of the ASAE. 21:522-528.

Smith, A. E. and D. V. Phillips. 1975. Degradation of alachlor by Rhizoctonia solani. Agron. J. 67:347-349.

Smith, C. N., R. A. Leonard, G. W. Langdale and G. W. Bailey. 1978. Transport of agricultural chemicals from small upland Piedmont watersheds, EPA-600/3-78-056. U. S. Environmental Protection Agency, Athens, Ga. 364pp.

Standard methods for the examination of water and wastewater. 1965. Am. Public Health Assoc., Inc. N.Y., N.Y.

Stephens, J. C. 1969. Peat and muck drainage problems. Trans. of the Am. Soc. of Civil Engineers, Journal of the Irr. and Drainage Div. 95:285-305.

Tate, R. L., III. 1978. Cultural and environmental factors affecting the longevity of Escherichia coli in Histosols. Appl. Microbiol. 35:925-929.

Tomberg, U. Kh. 1957. Certain hydrophysical properties of peat soils and their alteration on reclamation under conditions prevailing in the Estonian SSR. Izvestiya Akademii Nauk Estonskoi SSR. Seriya Biologicheskaya. 6:225-233. Translated from Russian, IPST Cat. No. 1981.

U. S. Geological Survey Water Resources Data for 1971. Part 2. Water Quality Records. U. S. Geological Survey Water Resources Division, Raleigh, N.C.

Wastewater. 1965. Am. Public Health Assoc., Inc. N.Y., N.Y.

Weed Sci. Soc. Amer. 1979. Herbicide Handbook, 4th edition, Weed Sci. Soc. Amer. Champaign, IL. 479pp.

Whipple, W., J. V. Hunter, S. L. YU, J. P. Hewitt, and J. Cirello. 1974. Unrecorded pollution and dynamics of biochemical oxygen demand. New Jersey Water Resources Res. Inst. Report (no No. on report).

Young, C. C. and H. Greenfield. 1923. Observations on viability of the Bact. coli group under natural and artificial conditions. A.J.P.H. 13:270-273 (as cited in Mallmann and Litsky, 1951).

APPENDIX A

Soil Profile Descriptions

Field 103

Drilled and Described: 2/27/76 E.E. Gamble and T.C. Jacobs

Depth, ft	Description
0-2	Sapric material, i.e., no recognizeable plant remains; very dark brown or darker (darker than 10YR 2/2)
2-8	Dark brown to dark reddish brown (7.5 YR - 5 YR 3/2) sapric material; the actual color is probably somewhat redder as the material darkens on exposure to the air; abrupt
8-8 1/2	Yellowish brown (10YR 5/4) medium fine sand; gradual
8 1/2 - 17 1/2	Greenish gray (10GY 5/1) light sandy loam with medium fine sands; occasional more clayey layers 1 to 2 inches thick; clear
17 1/2 - 22	Greenish gray (10GY 5/1) light sandy loam with medium fine sands; common to many fossils, nearly a hash in some areas; abrupt, with definite drilling change
Base of Pamlico msu	
Begin Yorktown Formation ?	
22 - 38 1/2	Dark bluish gray (10BG 4/1) sandy loam with medium fine sand; sparse fossils in upper 5-6'; grading to greenish gray (10Y 5/1) marly looking loam with common fossils; several pieces of coral at about 35'; grades
38 1/2 - 43 1/2+	Greenish gray (10GY 5/1) sandy loam with much fossil material and a few well rounded polished quartz pebbles up to 5 mm dia.

Base of hole 43 1/2'

APPENDIX A (Cont'd)

Depth, ft	Description
Set 2" casing to 39'.	

Field 104

Altitude, Ground Level

Drilled and Described: 3/16/77 E. E. Gamble

0-6	Dark reddish brown (5YR 3/2) sapric organic material; gradual to -
6-8	Very dark grayish brown (10YR 3/2) clay; gradual to -
8-23	Greenish gray (5GY 5/1) clay or silty clay grading down to dark greenish gray (5GY 4/1) silty clay loam at 23'; has a somewhat lumpy consistency when rubbed in the fingers especially in the upper part; clear to -
23 - 30	Dark greenish gray (5G to 5BG 4/1) medium fine sandy loam with common to many fossil fragments; abrupt to -
	Base of Pamlico
	Begin Croatan
30 - 43+	Dark greenish gray (5G 4/1) medium fine sandy loam - feels sort of "tough and brittle"; few coarse greenish gray (5GY 6/1) bodies in upper 4-5'; occasional thin dark streak; occasional thin sandy clay loam bed in upper part; grades to light sandy loam at 43'.
	Base of hole 43 ft.

Set 40' casing to 39'
Set 30' casing to 29'
Set 20' casing to 19'
Set 10' casing to 9'6"

APPENDIX A (Cont'd)

Field 102

Altitude, Ground Level

Drilled and Described: 3/17/77 E. E. Gamble

Depth, ft	Description
0-1	Dark reddish brown (5YR 3/2) sapric organic material; clear to -
1-2	Dark brown (7.5YR 3/2) sticky fine loam high in organic matter; darkens on exposure to air; clear
2 - 3 1/2	Dark grayish brown (10YR 4/2) very fine sandy loam; few mica flakes; gradual to -
3 1/2 - 8	Gray (5YR 5/1) fine sandy loam to loamy sand grading through dark greenish gray (5G 4/1) to dark gray (5Y 4/1) at 8'; the 5G 4/1 changes color to a yellowish cast on exposure to air; gradual to -
15 1/2 - 16 1/2	Gray (5Y 5/1) medium sand with few small shell fragments; clear to -
16 1/2 - 23	Dark gray to dark greenish gray (5Y - 5GY 4/1) medium light sandy loam; common fossil fragments; grades to dark greenish gray (5GY 4/1) medium fine light sandy loam at 18 ft; continues to 23'; gradual to -
23-30	Very dark greenish gray (darker than 5G 4/1) medium fine light sandy loam; few fossil fragments; abrupt to -
	Base Pamlico
30-43+	Dark greenish gray (5BG 4/1) smooth sticky silty clay loam; few to common fossil fragments; grades to 5GY 4/1) sticky silty clay with no fossils at 43 ft.

APPENDIX A (Cont'd)

Depth, ft	Description
	Base of Hole 43 ft.
	Set 40' to 39' Set 30' to 29' Set 20' to 19' Set 10' to 9'

Field 106

Altitude, Ground Level

Drilled and Described: 4/14/77 E. E Gamble

0-1.5	Dark reddish brown (5YR 3/2) sapric organic material; gradual boundary
1.5-3.5	Dark reddish brown to dark brown (5YR 3/2) - 7.5YR 3/2) clay loam with high organic matter content and a slick greasy feel; gradual boundary
3.5-5.0	Very dark grayish brown (10YR 3/2) silty clay loam to clay loam; clear boundary
5.0-6.5	Dark grayish brown (10YR 4/2) very fine sandy loam; abrupt boundary
6.5-7.0	Light gray (10YR 7/1) fine sand; abrupt boundary
7.0-8.5	Gray (5Y 5/1) fine sandy loam interbedded with a few thin (1-2 inches) silty clay to silty clay loam beds; clear boundary
8.5-10	Greenish gray (5GY 4/1) sandy loam to sandy clay loam; clear boundary
10-13.5	Greenish gray (10Y 5/1) medium fine to fine sand; clear boundary
13.5-21	Greenish gray (10GY 5/1) medium to medium fine sand; common fossils and fragments, abrupt boundary
21-23.5	Greenish gray (10GY 6/1) medium to

APPENDIX A (Cont'd)

Depth, ft	Description
	medium fine sand with many fossils and fragments--a hashy layer; abrupt contact.
	Base of Pamlico?
	Begin Croaton
23.5-25	Greenish gray (5BG 5/1) silty clay loam; few dark gray (5Y 4/1) stained areas up to 2 inches across; clear boundary
25-26	Olive gray (5Y 4/2) medium fine sandy loam; a few discrete organic remains and some organic staining; clear boundary
26-38	Gray (5Y 5/1) medium fine to fine sand grading to medium to medium fine sand at 38 ft.; organic remains scattered throughout; abrupt contact
	Base of Croatan
	Begin Yorktown?
38-40.5	Dark greenish gray (5G 4/1) medium fine sandy loam; few to common fossil fragments; grades to -
40.5-53.5	Dark greenish gray (5GY 4/1) silty clay loam with few fossil fragments scattered throughout; grades with depth to a "tough" silty clay to clay
	Base of hole 53.5 ft.

Field 107

Altitude, Ground Level

Drilled and Described: 3/17/77 E. E. Gamble

0-2	Dark reddish brown (5YR 3/2) sapric organic material; clear to -
2-3	Dark brown (7.5YR 3/2) sticky fine

Depth, ft	Description
	loam high in organic content; darkens on exposure to air; clear to -
3-6	Dark grayish brown (10YR 4/2) very fine light sandy loam; almost silty loam; has a sort of tough slightly brittle feel; clear to -
6-7	Grayish brown (2.5Y 5/2) medium fine to fine loamy sand; clear to -
7-8	Dark gray (5Y 4/1) clay to silty clay thin bedded with medium fine sandy loam; gradual to -
8 - 16 1/2	Greenish gray (5GY 5/1) medium fine to fine sandy loam in upper 2-3 ft. grading to medium fine to fine sand for the remainder; abrupt to -
16 1/2 - 18	Greenish gray (5GY 5/1) medium fine sandy loam; common fossil fragments; grades to -
18-22	Greeni[illegible]ay (5GY 5/1) medium fine sand[illegible]m; many fossils and fragments; abrupt to -
22-24	Very dark gray (darker than 5Y 4/1) medium fine loamy sand to sandy loam; few fossil fragments; abrupt to -
	Base of Pamlico
	Begin Croatan
24-28	Very dark gray (darker than 5Y 4/1) silty clay to silty clay loam apparently bedded with minor amounts of fine sand; grades to dark gray (5Y 4/1) at 28 ft.; gradual to -
28-40	Gray (5Y 5/1) fine light sandy loam; no fossils; abrupt to -
40-41	Dark gray (5Y 4/1) medium loamy sand; abrupt to -

Depth, ft	Description
	Base of Croatan?
	Begin Yorktown?
41-43+	Dark greenish gray (5GY 4/1) silty clay loam; few to common small fossils
	Base of hole 43 ft.
	Set 40' casing to 39' Set 30' casing to 29' Set 20' casing to 19' Set 10' casing to 9'

Appendix Table B. Summary of monthly runoff and rainfall amounts in cm for all sites. Rainfall in ().

1976

	101	102	103	104	106	107
July	2.89 (17.40)	2.23 (17.40)	4.99 (17.98)	3.51 (19.23)	10.76 (21.13)	10.04 (21.13)
August	1.15 (8.89)	1.05 (8.89)	0.89 (7.09)	0.78 (7.16)	3.79 (9.70)	0.49 (9.70)
Sept.	0.58 (12.70)	0.23 (12.70)	0.43 (8.00)	0.0 (9.02)	1.70 (9.14)	0.20 (9.14)
Oct.	0.52 (6.92)	0.27 (6.92)	0.51 (5.59)	0.0 (6.22)	1.67 (6.9)	1.21 (6.9)
Nov.	1.58 (5.21)	0.72 (5.21)	0.82 (7.39)	0.36 (7.37)	2.06 (6.35)	1.46 (6.35)
Dec.	4.23 (10.92)	5.81 (10.92)	3.98 (7.09)	4.06 (9.78)	8.32 (10.03)	7.63 (10.03)
Total	10.95 (72.05)	10.31 (62.05)	11.62 (53.14)	8.71 (58.78)	28.30 (63.25)	21.03 (63.25)

1977

	101	102	103	104	106	107
Jan.	3.58 (3.68)	5.81 (3.68)	7.15 (7.24)	5.92 (6.99)	4.24 (4.32)	7.14 (4.32)
Feb.	1.35 (3.17)	1.63 (3.17)	0.84 (1.02)	1.77 (2.03)	0.95 (4.45)	1.93 (4.45)
Mar.	4.21 (8.64)	6.62 (8.64)	2.61 (6.60)	5.06 (8.89)	8.08 (10.80)	8.17 (10.80)
Apr.	1.29 (3.56)	0.95 (3.56)	0.46 (2.67)	1.26 (3.30)	0.49 (3.18)	0.41 (3.18)
May	1.39 (9.27)	0.19 (9.27)	6.73 (18.67)	5.25 (15.11)	7.85 (14.35)	1.78 (14.35)
June	0.48 (6.88)	0.02 (6.88)	1.97 (4.06)	2.06 (3.68)	0.49 (5.46)	0.08 (5.46)
July	0.82 (9.40)	0.0 (9.40)	0.23 (6.99)	0.49 (10.79)	1.49 (5.49)	0.0 (5.49)
Aug.	1.48 (18.29)	0.47 (18.29)	0.15 (8.00)	1.44 (16.89)	3.98 (15.88)	0.66 (15.88)
Sept.	0.27 (5.59)	0.12 (5.59)	1.38 (5.72)	1.62 (10.29)	10.36 (17.15)	5.19 (17.15)

Appendix Table B. (Continued)

	101	102	103	104	106	107
Oct.	2.40 (16.76)	0.71 (16.76)	4.95 (15.85)	5.18 (19.30)	11.69 (20.57)	5.89 (20.57)
Nov.	6.67 (9.35)	4.13 (9.35)	12.04 (9.35)	12.33 (13.21)	13.39 (14.83)	15.89 (14.83)
Dec.	2.02 (8.39)	2.78 (8.39)	3.90 (9.65)	7.61 (11.07)	6.66 (9.53)	5.03 (9.53)
Total	25.96 (102.98)	23.43 (102.98)	42.41 (96.4)	49.99 (121.55)	69.67 (126.01)	51.63 (126.01)
			1978			
Jan.	16.97 (22.61)	17.40 (22.61)	10.46 (14.15)	12.64 (18.59)	21.59 (20.17)	22.50 (20.17)
Feb.	2.34 (3.71)	5.47 (3.71)	2.56 (3.25)	6.53 (4.32)	2.00 (4.95)	5.46 (4.95)
Mar.	5.69 (13.34)	7.91 (13.34)	4.55 (8.61)	8.52 (10.95)	8.14 (8.74)	11.54 (8.74)
Apr.	1.27 (7.62)	3.32 (7.62)	5.00 (12.32)	5.51 (12.37)	8.62 (14.02)	8.04 (14.02)
May	9.93 (12.19)	6.96 (12.19)	5.85 (9.32)	13.06 (15.67)	8.90 (15.57)	8.74 (15.57)
June	10.92 (16.89)	8.79 (16.89)	1.68 (12.06)	5.34 (14.35)	1.71 (8.26)	1.20 (8.26)
July	1.39 (13.34)	0.85 (13.34)	0.43 (4.45)	1.55 (15.49)	0.44 (9.58)	0.0 (9.58)
Aug.	5.30 (21.08)	3.72 (21.08)	3.64 (11.94)	10.61 (18.16)	0.01 (4.70)	0.0 (4.70)
Sept.	0.0 (1.02)	0.05 (1.02)	0.24 (0.0)	0.16 (0.51)	0.00 (1.40)	0.0 (1.40)
Oct.	0.0 (2.79)	0.0 (2.79)	0.20 (1.32)	0.02 (4.19)	0.00 (2.16)	0.0 (2.16)
Nov.	0.12 (8.36)	0.0 (8.36)	0.36 (7.16)	0.01 (.26)	0.10 (8.05)	0.0 (8.05)
Dec.	3.28 (7.85)	0.67 (7.85)	1.95 (3.56)	1.02 (6.38)	3.49 (6.45)	0.0 (6.45)
Total	57.21 (130.8)	55.14 (130.8)	36.92 (88.14)	64.97 (129.24)	55.0 (104.05)	57.48 (104.05)

Appendix Table B. (Continued)

	101	102	103	104	106	107
			1979			
Jan	13.36	11.90	10.54	12.94	13.83	11.27
	(17.04)	(17.04)	(12.01)	(14.58)	(15.11)	(15.11)
Feb.	4.74	4.57	5.57	5.29	8.02	7.76
	(8.89)	(8.89)	(6.93)	(11.56)	(8.56)	(8.56)
Mar.	2.45	5.19	3.73	8.37	4.90	6.49
	(7.11)	(7.11)	(3.81)	(6.20)	(7.87)	(7.87)
Apr.	0.89	4.02	2.68	5.14	5.52	4.20
	(10.54)	(10.54)	(9.91)	(11.86)	(12.04)	(12.04)
May	5.97	5.93	3.17	4.65	1.87	5.17
	(16.36)	(16.36)	(13.87)	(11.07)	(10.62)	(10.62)
June	1.18	1.92	1.73	1.37	0.18	0.01
	(10.59)	(10.59)	(5.95)	(7.82)	(6.86)	(6.86)
July	6.31	0.87	1.24	0.23	4.22	0.0
	(20.29)	(20.29)	(10.29)	(9.14)	(18.75)	(18.75)
Total	34.90	34.40	28.66	37.99	38.54	34.90
	(90.82)	(90.82)	(62.76)	(72.23)	(79.81)	(79.81)

Appendix Table C. Piezometer data for individual sites. Values are depths in cm to water in piezometers.

Date	Piezometer Depth			Gradient*		
	6.1 m	9.1 m	12.2 m	6 - 9	9 - 12	6 - 12
UNDEVELOPED MINERAL SITE 102						
7-13-77	112	97	117	-.049	.066	.008
8-22-77	143	119	125	-.079	.020	-.029
9-6-77	135	104	119	-.102	.049	-.026
9-20-77	183	151	151	-.105	.000	-.053
11-29-77	97	81	87	-.152	.020	-.017
1-5-78	104	101	94	-.010	-.023	-.017
2-28-78	97	107	113	.033	.020	.027
3-39-78	85	40	67	-.148	.089	-.029
4-25-78	99	84	85	-.049	.003	-.023
5-10-78	67	55	62	-.039	.023	-.008
5-23-78	93	70	73	-.075	.010	-.033
6-14-78	81	62	82	-.062	.066	.002
7-19-78	108	86	89	-.072	.010	-.031
8-8-78	88	64	73	-.079	.030	-.025
9-12-78	124	108	103	-.052	.016	-.035
9-19-78	138	120	115	-.059	-.016	-.038
DEVELOPED SHALLOW ORGANIC SITE 106						
7-13-77	73	75		.007		
8-22-77	55	51		-.013		
9-6-77	104	104		.000		
9-20-77	66	71		.016		
10-11-77	85	85		.000		
11-29-77	52	52		.000		
1-5-78	41	43		.007		
2-28-78	44	46		.007		
3-29-78	47	54		.023		
4-25-78	67	70		.010		
5-10	36	36		.000		
5-23-78	76	78		.007		
6-14-78	74	75		.003		

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*Downward gradients are given as positive; upward gradients as negative.

Appendix Table C. (Continued)

Date	Piezometer Depth			Gradient*		
	6.1 m	9.1 m	12.2 m	6 - 9	9 - 12	6 - 12
	UNDEVELOPED SHALLOW ORGANIC SITE 107					
7-13-77	122	122	124	.000	.007	.003
8-22-77	87	85	85	-.007	.000	-.003
9-6-77	152	143	143	-.029	.000	-.015
9-20-77	105	98	98	-.023	.000	-.011
10-11077	140	140	140	.000	.000	.000
11-29-77	90	85	85	-.016	.000	-.008
1-5-78	76	82	73	.019	-.030	-.005
2-28-78	82	76	76	-.019	.000	-.010
3-29-78	76	76	70	.000	-.019	-.010
4-25-78	82	79	78	-.010	.007	-.007
5-10-78	58	56	56	-.007	.000	-.003
5-23-78	89	82	82	-.023	.000	-.011
6-14-78	125	133	3	.026	-.427	-.200
7-19-78	155	146	151	-.029	.016	-.007
7-26-78	102	103	101	.003	-.007	-.002
8-9-78	150	136	135	-.046	-.003	-.025
8-16-78	128	123	123	-.016	.000	-.008
8-29-78	202	190	182	-.039	.007	-.016
9-12-78	242	225	225	-.056	.000	-.028
9-19-78	210	221	224	.036	.010	.023
10-10-78	226	232	235	.019	.010	.015
	DEVELOPED DEEP ORGANIC SITE 103					
4-6-76	100	45	103	-.180	.190	.010
5-4-76	131	91	151	-.131	.197	.066
6-28-76	100	76	100	-.079	.078	.000
7-12-76	181	64	84	-.384	.066	-.318
8-24-76	114	79	119	-.114	.131	.016

*Downward gradients are given as positive; upward gradients as negative.

Appendix Table C. (Continued)

Date	Piezometer Depth			Gradient*		
	6.1 m	9.1 m	12.2 m	6 - 9	9 - 12	6 - 12
DEVELOPED DEEP ORGANIC SITE 103 (Continued)						
9-14-76	123	80	125	-.141	.148	.066
10-12-76	138	116	142	-.072	.085	.016
11-22-76	118	122	139	.013	.056	.069
1-4-77	100	97	96	-.010	-.003	-.013
3-9-77	96	82	90	-.046	.026	-.019
5-11-77	112	91	108	-.069	.056	-.013
6-8-77	95	77	100	.059	.075	.016
8-22-77	98	108	133	.032	.082	.115
9-6-77	108	106	118	-.007	.039	.033
9-20-77	101	98	107	-.010	.029	.019
10-11-77	103	103	125	-.000	.072	.072
11-8-77	29	52	48	.075	-.013	.062
11-29-77	88	71	95	-.056	.079	.026
4-5-78	99	77	103	-.072	.085	.013
5-23-78	87	101	92	.046	-.030	-.013
7-19-78	117	84	121	-.108	.121	.013
8-8-78	113	86	116	-.089	.098	.010
UNDEVELOPED DEEP ORGANIC SITE 104						
8-22-77	104	97	89	.023	.026	-.025
9-6-77	116	110	107	.020	.010	-.015
9-20-77	102	107	99	-.016	.026	.005
10-11077	119	122	125	-.010	-.010	.010
11-8-77	80	55	52	.049	.010	-.029
11-29-77	91	101	93	-.033	.026	.003
2-16-78	89	100	94	-.036	.020	.008
2-28-78	96	93	90	.010	.010	-.010
3-29-78	84	84	79	.000	.016	-.008
4-25-78	91	95	89	-.013	.0196	-.003

*Downward gradients are given as positive; upward gradients as negative.

Appendix Table C (Continued)

Date	Piezometer Depth 6.1 m	 9.1 m	 12.2 m	 6 - 9	Gradient* 9 - 12	 6 - 12
			UNDEVELOPED DEEP ORGANIC SITE 104 (Continued)			
5-10-78	73	70	66	.010	.013	-.011
6-1-78	86	102	94	-.052	.026	.013
6-14-78	88	122	110	-.110	.039	.036
7-19-78	113	125	117	-.039	.026	.007
7-26-78	107	105	100	.007	.016	-.011
8-8-78	91	95	88	-.013	.023	-.005
8-16-78	81	81	74	.000	.023	-.011
8-29-78	102	117	107	-.049	.032	.008
9-12-78	112	122	117	-.033	.016	.008
9-19-78	123	133	133	.033	.000	.016
10-10-78	131	131	131	.000	.000	.000
3-13-79	87	93	85	.020	-.026	-.003
5-16-79	93	96	90	.010	-.020	-.005
7-10-79	146	246	119	.328	-.417	-.044

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*Downward gradients are given as positive; upward gradients as negative.

Appendix Table D. Weekly flow volumes and each physical and chemical measurement made on the drainage water during the study.

Key to Table

ST. - Gives location; 101 and 102 are developed and undeveloped mineral soil sites, respectively; 103 and 104 are developed and undeveloped deep organic sites, respectively; and 106 and 107 are developed and undeveloped shallow organic sites, respectively.

Flow Volume - Cubic feet of flow since last sample

NO_3-N - Nitrate-nitrogen in mg/l

TC - Temperature in °C

COND - Conductivity in umho/cm

D.O. - Dissolved oxygen in mg/l

TURB - Turbidity in J.T.U.

F.S. - Filterable solids (> 0.45μm)

BOD - Biological oxygen demand in mg/l

Col-F - Fecal coliform bacteria no/100ml

Col-T - Total coliform bacteria no/100ml

TKN - Total Kjeldahl nitrogen in mg/l

P and other elements in mg/l

TOC - Total organic carbon (not filtered) in mg/l

A number preceded by M in tables means that this value was not measured, but is an interpolated value from previous and following measured value and is the concentration used to obtain flux for that period.

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10119760714	24742.07	.00	22	60	5.0	5.5	<25	0	63	5.2	11	4400	1.12
10119760721	14702.78	M .01	M 24	M 85	M 5.5	M 5.9	M 25	M 0	M 158	M 6.5	M 9	M2750	M1.18
10119760727	5315.10	.02	27	110	6.0	6.3	<25	0	254	8.0	8	1100	1.26
10119760803	3852.34	G .08	24	90	5.9	M 4.8	<25	0	98	M 6.3	M 11	M1515	2.58
10119760810	8193.24	.04	24	55	6.7	3.2	M 29	1	9	4.3	15	2000	2.24
10119760817	16662.34	.00	M 24	M 80	5.7	M 4.1	M 33	M 0	112	M 5.0	M 8	M1100	1.06
10119760824	3386.60	.08	24	105	6.8	5.1	M 38	0	20	3.7	1	200	1.43
10119760831	582.19	.05	20	90	6.5	M 4.6	M 43	0	147	M 3.5	M 3	M 363	1.96
10119760907	120.32	M .05	18	96	M 6.0	4.2	M 48	0	M 95	M 5.4	M 5	M 526	M1.77
10119760916	2216.20	.06	22	25	5.6	M 4.3	54	0	44	M 5.3	M 7	M 689	1.60
10119760922	8907.46	.03	22	80	6.7	4.6	130	0	6	5.2	11	900	1.96
10119760928	2767.95	.04	22	65	6.9	M 4.1	100	0	17	M 4.1	M 8	M1300	2.86
10119761005	2675.76	.04	18	90	6.9	3.8	170	0	35	3.0	5	1700	1.65
10119761012	1410.63	G .03	M 14	M 77	6.7	M 4.4	M 135	M 0	35	M 2.9	M 4	M1105	5.91
10119761018	276.12	.05	11	65	5.7	M 5.1	140	0	130	M 2.9	M 3	M 670	1.82
10119761026	6494.55	.10	23	60	5.8	5.8	45	0	23	2.9	3	230	.48
10119761102	4842.33	.03	09	40	6.8	M 7.1	43	0	16	M 2.3	M 1	M 127	.98
10119761109	4027.82	.03	06	60	6.4	8.3	86	0	20	1.9	0	37	0.90
10119761115	2988.38	.03	04	80	6.6	M 7.6	62	0	10	M 2.4	M 0	M 97	0.87
10119761122	15878.97	.13	08	70	5.5	7.1	<25	0	13	2.9	0	150	0.87
10119761130	14149.60	.04	M 10	M 60	5.3	M 7.7	<25	M 0	8	M 2.7	M 0	M 261	0.56
10119761207	14848.32	.15	14	50	5.9	8.5	<25	0	48	2.5	0	390	1.40
10119761214	21252.69	.15	05	45	5.2	M 6.5	<25	0	4	M 2.0	M 0	M 285	0.59
10119761220	33347.27	.06	09	45	5.1	4.6	<25	0	6	1.5	0	100	1.04
10119761229	34218.77	.03	07	40	6.3	M 5.1	<25	1	10	M 1.3	M 0	M 131	0.56
10119770105	17477.98	.01	07	38	4.6	6.0	28	0	27	1.1	0	89	1.01

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10119760714	24742.07	<.1	.06	43	5.4	M 7.4	M 2.2	M 2.0	M 1.6	M .00	M11.6	M .02	M .01	M .00
10119760721	14702.78	M .0	M .05	M 53	M 6.1	M 9.3	M 2.3	M 2.4	M 1.9	M .00	M20.3	M .01	M .01	M .00
10119760727	5315.10	<.1	.04	63	6.9	M11.2	M 2.4	M 2.8	M 3.3	M .00	M29.0	M .00	M .01	M .00
10119760803	3852.34	<.1	.19	63	8.0	13.0	2.5	3.2	2.7	.00	36.5	.00	.02	.00
10119760810	8193.24	<.1	.16	68	9.2	M11.8	M 2.4	M 2.9	M 2.4	M .00	M34.8	M .00	M .01	M .00
10119760817	16662.34	<.1	.05	46	8.9	M10.5	M 2.3	M 2.6	M 3.1	M .00	M33.1	M .00	M .00	M .00
10119760824	3386.60	<.1	.17	69	10.6	M 9.3	M 2.2	M 2.3	M 1.8	M .00	M31.4	M .00	M .00	M .00
10119760831	582.19	<.1	.20	81	12.6	M 8.1	M 2.1	M 2.0	M 1.6	M .00	M29.7	M .00	M .00	M .00
10119760907	120.32	M .1	M .12	M 51	M 9.3	M 6.9	M 2.0	M 1.8	M 1.4	M .00	M28.0	M .00	M .00	M .00
10119760916	2216.20	0.3	.04	22	6.0	5.8	2.0	1.6	1.3	.00	M26.3	.00	.00	.00
10119760922	8907.46	0.9	.16	48	5.9	M 9.0	M 2.0	M 2.1	M 1.8	M .00	M24.2	M .00	M .00	M .00
10119760928	2767.95	0.2	.06	60	7.7	M11.2	M 2.0	M 2.4	M 3.2	M .00	M22.0	M .00	M .00	M .00
10119761005	2675.76	0.9	.10	52	7.2	13.3	2.0	2.9	2.7	.00	21.5	.00	.01	.00
10119761012	1410.63	0.2	.08	81	11.4	M12.8	M 1.8	M 3.0	M 2.7	M .00	M18.6	M .00	M .00	M .00
10119761018	276.12	<.1	.12	50	11.8	M12.1	M 1.6	M 3.1	M 2.7	M .00	M15.7	M .00	M .00	M .00
10119761026	6494.55	<.1	.09	35	8.6	M11.6	M 1.5	M 3.2	M 2.7	M .00	M13.2	M .00	M .00	M .00
10119761102	4842.33	<.1	.07	31	9.6	11.0	1.5	3.4	2.9	.00	10.0	.00	.00	.00
10119761109	4027.82	<.1	.06	25	11.7	M10.4	M 1.5	M 3.2	M 2.7	M .00	M 8.7	M .00	M .00	M .00
10119761115	2988.38	<.1	.32	35	10.2	M 9.8	M 1.5	M 3.0	M 2.5	M .00	M 7.4	M .00	M .00	M .00
10119761122	15878.97	<.1	.05	16	9.4	M 9.2	M 1.5	M 2.8	M 2.4	M .00	M 6.2	M .00	M .00	M .00
10119761130	14149.60	<.1	.03	17	8.7	M 8.6	M 1.5	M 2.6	M 2.3	M .00	M 4.9	M .00	M .00	M .00
10119761207	14848.32	<.1	.13	36	9.7	8.0	1.5	2.5	2.3	.00	3.5	.00	.00	.00
10119761214	21252.69	<.1	.02	29	8.8	M 7.2	M 1.5	M 2.4	M 2.2	M .00	M 2.9	M .00	M .00	M .00
10119761220	33347.27	<.1	.05	27	8.4	M 6.4	M 1.5	M 2.3	M 2.1	M .00	M 2.3	M .00	M .00	M .00
10119761229	34218.77	<.1	.02	25	7.6	M 5.8	M 1.5	M 2.2	M 2.0	M .00	M 1.8	M .01	M .00	M .00
10119770105	17477.98	<.1	.06	16	5.6	5.0	1.5	2.1	1.9	.00	1.2	.03	.00	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW	VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10119770113		31732.80	.10	02	30	4.5	M 4.1	<25	0	9	M 1.7	M 0	M 66	0.36
10119770119		23730.12	.00	03	40	4.9	2.1	<25	0	12	M 2.4	M 0	M 74	1.60
10119770127		18355.39	.00	04	45	M 5.0	2.3	43	0	40	M 2.9	M 0	M 80	0.92
10119770131		9336.02	.00	02	50	5.3	5.1	57	0	30	3.7	0	90	0.36
10119770207		10251.16	.01	05	60	4.9	5.0	M 49	0	M 29	M 3.1	0	440	0.36
10119770216		7144.73	.02	05	M 60	5.3	8.8	36	M 0	29	2.3	0	320	0.34
10119770224		7093.92	.06	-02	80	5.5	6.6	54	0	87	M 2.0	M 0	M 309	0.80
10119770302		14380.30	.07	07	50	5.5	6.4	<25	0	18	1.9	0	300	0.64
10119770310		25660.08	.08	M 9	M 62	4.8	M 5.8	<25	M 0	13	M 1.8	M 0	M 355	0.56
10119770317		32042.73	.07	12	80	5.5	5.0	40	0	70	1.8	0	430	0.62
10119770323		25619.83	.04	M 16	M 74	M 5.4	M 5.9	M 41	M 0	M 61	M 2.3	M 0	M 474	0.34
10119770401		24001.64	.00	20	70	5.4	6.8	43	0	55	M 2.7	M 0	M 512	0.70
10119770406		7943.86	.14	16	65	5.3	5.8	80	0	109	3.4	2	570	1.40
10119770413		9746.79	.09	M 18	M 87	5.7	M 6.2	52	M 0	43	M 4.4	M 1	M 350	2.38
10119770420		8098.29	.12	23	120	6.5	6.8	86	0	106	5.9	0	43	1.60
10119770427		5937.84	.04	M 24	M 110	5.4	M 6.8	62	M 0	60	M 5.4	M 0	M 306	1.62
10119770504		6809.85	.04	26	100	5.8	6.8	78	0	84	5.0	1	570	0.84
10119770511		8981.18	.06	M 26	M 122	5.6	M 6.8	51	M 0	39	M 3.9	M 0	M 835	1.68
10119770519		6201.47	.01	27	145	5.8	6.9	83	0	59	2.8	0	1100	1.39
10119770526		7059.46	.12	M 31	M 118	5.0	M 6.7	38	M 0	49	M 3.3	M 335	M1206	1.76
10119770601		11697.65	.17	36	95	5.8	6.6	M 70	M 0	201	3.9	630	1300	1.68
10119770607		4011.07	.02	M 31	M 107	6.0	M 5.4	99	M 0	98	M 4.7	M 315	M 710	1.33
10119770614		2515.20	.00	26	120	4.6	4.3	195	0	165	5.6	0	120	2.46
10119770621		667.62	.00	M 26	M 176	4.6	M 4.8	225	M 0	161	M 8.8	M 1	M 585	2.94
10119770629		3900.49	.02	M 26	M 232	4.1	M 5.5	999	M 0	M 231	12.0	M 2	M1050	3.92
10119770706		14678.37	.49	M 27	M 296	6.4	M 6.3	263	M 0	312	M10.4	M 4	M1581	13.2
10119770713		3368.45	.46	29	353	6.6	7.1	54	0	109	9.0	7	2047	3.64
10119770721		1114.85	.06	M 25	M 314	6.9	M 6.3	M 171	M 0	75	M 7.7	M 17	M1740	3.22
10119770726		2294.22	M .81	22	270	M 6.6	5.6	M 304	0	M 150	6.3	29	1390	M4.94
10119770802		784.40	M .78	M 23	M 257	M 6.4	M 5.4	M 388	M 0	M 197	M 7.2	M 271	M1212	6.02
10119770810		0.00	M .74	M 24	M 239	M 6.2	M 5.2	M 505	M 0	M 262	M 8.5	M 611	M 963	M5.62
10119770817		669.99	.71	26	220	6.1	5.0	640	0	338	10.0	1000	680	5.18
10119770822		35716.48	2.50	29	350	4.9	8.6	43	0	46	6.8	400	3000	6.86
10119770830		1946.96	3.51	M 28	M 335	5.0	M 8.4	M 47	M 0	M 40	M 6.4	M 660	M2750	2.94
10119770906		0.00	M3.97	M 26	M 285	M 5.4	M 8.2	M 54	M 0	M 30	M 5.8	M 947	M2350	M4.06
10119770913		6282.90	4.38	26	250	5.9	8.2	61	0	23	5.3	1200	2000	5.04
10119770920		671.76	2.31	M 23	M 236	6.1	M 8.6	M 92	M 0	M 19	M 4.8	M 961	M1670	4.20
10119770927		0.00	M2.32	M 20	M 222	M 5.8	M 9.0	M 124	M 0	M 15	M 4.3	M 722	M1340	M3.22
10119771004		0.00	M2.33	M 18	M 208	M 5.5	M 9.5	M 155	M 0	M 11	M 3.9	M 484	M1010	M6.24
10119771011		0.00	M2.35	M 16	M 194	M 5.2	M10.0	M 187	M 0	M 7	M 3.5	M 246	M 600	M7.26
10119771018		13917.46	2.38	14	180	5.0	10.6	220	0	3	3.2	8	350	8.29
10119771025		3419.83	C .16	M 19	M 180	6.2	M 8.9	710	M 0	147	M 2.9	M 18	M 470	2.18
10119771103		81720.07	C .72	24	180	5.0	7.2	5	0	6	2.7	29	390	1.18
10119771108		107313.25	.60	M 15	M 131	5.1	M11.5	8	M 0	12	M 5.3	M 22	M 307	2.07
10119771115		53125.31	.48	10	105	6.2	14.0	37	0	70	6.8	19	150	2.10
10119771122		2426.28	.10	M 12	M 120	6.7	M11.8	122	M 0	196	M 5.2	M 26	M 95	2.35
10119771129		2820.79	.18	15	135	6.0	9.6	1450	0	235	3.7	33	40	2.55
10119771206		3345.72	C .20	M 10	M 117	6.8	M10.9	100	M 0	108	M 4.4	M 30	M 130	2.02
10119771212		3304.26	.38	6	100	6.4	12.3	79	0	85	5.1	27	220	5.32
10119771220		11868.76	.62	M 5	M 97	5.2	M11.8	18	M 0	22	M 4.7	M 22	M 332	1.20
10119771230		23248.06	2.17	M 4	M 93	5.8	M11.2	22	M 0	8	M 4.3	M 15	M 482	2.13
10119780105		33433.70	1.48	4	98	5.1	10.5	58	0	118	3.8	7	670	1.76

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10119770113	31732.50	<.1	.03	30	6.6	M 6.9	M 1.9	M 2.0	M 1.8	M .00	M 2.3	M .02	M .00	M .00
10119770119	23738.12	0.3	.48	32	10.2	M 9.2	M 2.3	M 1.9	M 1.7	M .00	M 3.6	M .01	M .00	M .00
10119770127	18355.39	<.1	.02	16	8.2	M10.9	M 2.6	M 1.8	M 1.6	M .00	M 4.5	M .01	M .00	M .00
10119770131	9336.82	<.1	.09	26	8.7	M13.2	M 3.1	M 1.7	M 1.5	M .00	M 5.8	M .01	M .00	M .00
10119770207	10251.16	<.1	.04	26	11.2	14.4	3.5	1.7	1.5	.00	6.6	.01	.00	.00
10119770216	7144.73	<.1	.08	30	10.4	M12.4	M 2.8	M 1.7	M 1.4	M .00	M 5.9	M .01	M .00	M .06
10119770224	7093.92	<.1	.03	28	10.5	M 9.8	M 1.9	M 1.7	M 1.2	M .00	M 5.0	M .01	M .01	M .00
10119770302	14388.30	<.1	.01	33	8.8	7.6	1.2	1.8	1.2	.00	4.3	.01	.02	.00
10119770310	25668.08	<.1	.04	23	8.2	M 7.3	M .9	M 1.7	M 1.1	M .00	M 4.2	M .01	M .01	M .00
10119770317	32042.73	<.1	.02	25	7.4	M 6.9	M .5	M 1.6	M 1.0	M .00	M 4.1	M .01	M .01	M .00
10119770323	25619.83	<.1	.02	28	6.7	M 6.5	M .4	M 1.5	M .9	M .00	M 4.1	M .01	M .01	M .00
10119770401	24001.64	<.1	.04	25	7.1	6.3	0.3	1.5	0.9	.00	4.2	.01	.02	.00
10119770406	7943.86	0.4	.08	40	7.8	M 6.8	M .4	M 1.4	M .9	M .00	M 6.1	M .00	M .02	M .00
10119770413	9746.79	1.1	.04	26	8.3	M 7.1	M .5	M 1.3	M .9	M .00	M 7.2	M .00	M .02	M .00
10119770420	5090.29	0.1	.08	72	11.6	M 7.3	M .6	M 1.2	M .9	M .00	M 8.7	M .00	M .02	M .00
10119770427	5937.84	0.1	.03	76	11.5	M 7.9	M .8	M 1.1	M 1.0	M .00	M10.3	M .00	M .03	M .00
10119770504	6809.85	<.1	.05	56	9.9	8.4	1.0	1.2	1.2	.00	11.9	.00	.05	.00
10119770511	8961.18	<.1	.09	47	10.5	M12.6	M 2.9	M 1.1	M 1.1	M .00	M11.2	M .00	M .03	M .00
10119770519	6201.47	<.1	.08	60	11.2	M16.8	M 3.0	M 1.0	M 1.0	M .00	M10.5	M .00	M .02	M .00
10119770526	7659.46	<.1	.08	45	8.4	M21.6	M 4.2	M .8	M .9	M .00	M 9.9	M .01	M .00	M .00
10119770601	11697.68	0.2	.03	45	8.1	25.9	5.4	0.8	0.9	.00	9.4	.02	.00	.00
10119770607	4311.07	0.3	.05	59	8.6	M23.8	M 8.1	M 7.7	M 1.2	M .00	M13.3	M .01	M .00	M .00
10119770614	2515.20	<.1	.16	82	14.0	M21.6	M10.9	M14.5	M 1.5	M .00	M17.3	M .01	M .00	M .00
10119770621	667.62	<.1	.10	100	15.0	M19.1	M14.1	M22.7	M 1.9	M .00	M21.9	M .01	M .00	M .00
10119770629	3900.49	0.7	.16	111	14.1	M16.7	M17.4	M30.8	M 2.3	M .00	M26.6	M .01	M .00	M .00
10119770706	14678.37	9.9	.31	59	64.3	14.0	21.2	40.1	2.9	.00	32.0	.02	.02	.06
10119770713	3368.45	0.4	.18	83	29.6	M13.6	M19.5	M37.9	M 3.1	M .00	M26.6	M .02	M .22	M .00
10119770721	1114.85	<.1	.24	85	29.1	M13.2	M17.8	M35.8	M 3.3	M .00	M21.3	M .02	M .43	M .00
10119770726	2294.22	M .7	M .22	M 98	M32.1	M12.8	M15.9	M33.4	M 3.5	M .01	M15.2	M .03	M .67	M .00
10119770802	754.40	1.2	.22	107	34.0	M12.5	14.8	32.0	3.7	.02	11.5	.04	.83	.00
10119770810	0.00	M 1.0	M .18	M 85	M34.0	M12.1	M13.6	M30.5	M 3.6	M .01	M10.6	M .04	M .76	M .00
10119770817	669.99	0.8	.14	60	34.2	M11.7	M12.3	M28.9	M 3.4	M .01	M 9.6	M .04	M .69	M .00
10119770822	35716.48	1.9	.20	M 30	41.0	M11.4	M11.1	M27.5	M 3.3	M .01	M 8.7	M .04	M .63	M .00
10119770830	1946.96	0.4	.05	44	48.5	M11.1	M10.2	M26.5	M 3.2	M .01	M 8.1	M .04	M .58	M .00
10119770906	0.00	M 1.3	M .03	M 39	M41.6	M10.7	M 8.9	M24.9	M 3.1	M .01	M 7.1	M .04	M .51	M .00
10119770913	6282.90	2.2	.06	36	35.7	M10.4	M 7.7	M23.5	M 3.0	M .01	M 6.3	M .04	M .45	M .00
10119770920	671.76	1.6	.06	44	38.0	M10.1	M 6.6	M22.1	M 2.9	M .01	M 5.5	M .04	M .39	M .00
10119770927	0.00	M 1.3	M .06	M 42	M39.6	M 9.8	M 5.5	M20.7	M 2.8	M .01	M 4.7	M .04	M .33	M .00
10119771004	0.00	M .9	M .07	M 41	M41.2	M 9.5	M 4.4	M19.3	M 2.7	M .01	M 3.9	M .04	M .27	M .00
10119771011	0.00	M .6	M .08	M 40	M42.9	M 9.2	M 3.3	M17.9	M 2.6	M .01	M 3.1	M .04	M .21	M .00
10119771018	13917.46	M .3	.10	39	44.6	M 8.9	M 2.1	M16.5	M 2.5	M .01	M 2.3	M .04	M .15	M .00
10119771025	3419.83	<.1	.07	40	44.4	M 8.6	M 1.0	M15.1	M 2.5	M .01	M 1.5	M .04	M .09	M .00
10119771103	51720.07	<.1	.02	38	33.6	8.5	0.0	13.8	2.5	.02	.8	.04	.04	.00
10119771108	107313.25	.2	.04	38	27.7	M 8.5	M .1	M12.8	M 2.6	M .02	M .8	M .03	M .03	M .00
10119771115	53125.31	.6	.13	42	23.2	M 8.5	M .2	M12.2	M 2.6	M .02	M .8	M .02	M .02	M .00
10119771122	2426.28	.2	.25	58	22.5	M 8.5	M .3	M11.4	M 2.7	M .02	M .9	M .02	M .01	M .00
10119771129	2820.79	.4	.12	63	22.9	8.5	.5	10.8	2.9	.04	1.1	.03	.02	.00
10119771206	3345.72	.1	.14	42	19.0	14.4	0.0	13.5	3.2	.01	10.4	.02	.03	.00
10119771212	3304.26	.6	.65	106	45.5	M13.9	M .0	M13.1	M 3.1	M .01	M 8.9	M .02	M .03	M .00
10119771220	11568.76	.1	.04	45	18.5	M13.4	M .0	M12.8	M 3.0	M .01	M 7.6	M .02	M .03	M .00
10119771230	23248.06	.1	.04	58	33.4	M12.9	M .0	M12.4	M 2.9	M .01	M 6.0	M .02	M .04	M .00
10119780105	33433.70	<.1	.05	40	22.1	12.3	0.0	12.1	2.8	.02	4.0	.04	.06	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10119780110	16908.23	1.06	M 7	M 79	5.3	M10.7	20	M 0	34	M 3.4	M 12	M1395	1.71
10119780117	28088.38	0.79	11	70	4.8	11.0	28	0	68	3.2	17	2000	1.20
10119780124	272093.75	0.92	M 8	M 60	5.2	M14.0	660	M 0	158	M 3.9	M 8	M5999	1.40
10119780131	100582.63	0.75	6	50	5.3	17.2	31	0	49	4.6	0	9999	2.52
10119780207	10836.69	C0.06	M 5	M 52	5.6	M15.5	30	M 0	46	M 7.3	M 0	M7849	1.74
10119780216	13932.89	C0.01	4	55	6.3	13.9	45	0	97	10.0	0	5700	1.65
10119780224	24654.11	C0.92	M 5	M 57	5.4	M10.6	28	M 0	138	M13.7	M 0	M7975	2.04
10119780228	7710.81	C0.05	7	60	5.8	7.8	46	0	110	17.0	1	9999	2.38
10119780308	38484.63	1.41	M 10	M 50	5.5	M 8.3	40	M 0	44	M12.4	M 0	M6776	1.65
10119780314	64768.21	1.36	18	38	5.2	9.6	825	0	221	3.3	0	330	1.34
10119780321	18236.25	0.42	M 16	M 48	5.4	M 8.4	100	M 0	57	M 5.4	M 9	M 449	2.07
10119780329	27840.48	0.36	14	70	5.2	7.0	37	0	38	8.0	21	590	2.38
10119780405	5041.81	0.14	M 16	M 71	5.4	M 7.5	100	M 0	44	M 8.4	M 36	M 510	3.05
10119780412	1207.07	M .12	M 18	M 73	M 5.4	M 8.0	M 140	M 0	M 60	M 8.8	M 88	M 440	M2.98
10119780419	608.94	0.12	20	75	5.5	8.5	180	0	77	9.3	120	370	2.91
10119780425	1358.11	0.72	M 19	M 77	M 5.1	M 8.5	M 89	M 0	M 45	M11.9	M 68	M 248	2.94
10119780427	14228.02	C1.56	M 19	M 79	4.9	M 8.5	12	M 0	19	M14.2	M 23	M 144	1.37
10119780502	15247.69	C0.04	19	80	5.7	8.5	37	0	54	15.0	9	110	2.13
10119780510	90003.38	C0.06	M 17	M 83	5.2	M 8.5	24	M 0	30	M11.1	M 5	M 683	3.67
10119780516	75103.31	0.24	16	90	5.2	8.6	32	0	35	5.1	1	1600	2.10
10119780522	75103.31	0.18	M 22	M 93	5.6	M 6.0	63	M 0	63	M 8.0	M 14	M1730	2.97
10119780529	15060.73	C0.10	20	97	5.1	3.5	230	0	93	11.0	27	1900	5.33
10119780606	154127.13	0.29	M 23	M 89	6.0	M 5.2	120	M 0	117	M 9.3	M 117	M2273	3.75
10119780614	107954.50	C0.13	18	80	6.4	7.3	240	0	167	7.5	220	2700	3.95
10119780620	21590.91	M1.22	M 20	M 377	M 6.1	M15.4	M 203	M 0	M 116	M 8.9	M 94	M1320	M6.33
10119780628	1374.14	2.04	23	600	6.0	21.5	180	0	78	10.0	1	300	5.12
10119780705	302.81	M2.92	M 21	M 509	M 5.7	M12.8	M 86	M 0	M 39	M 7.4	M3333	M1633	M7.54
10119780712	16399.79	13.70	20	430	5.6	5.2	4	0	6	5.3	9999	2800	M7.03
10119780718	9321.37	M2.40	M 23	M 736	5.4	M12.1	10	M 0	15	M11.0	M4632	M3553	M6.52
10119780725	5567.85	M1.29	31	1000	M 5.5	10.2	M 12	0	M 20	16.0	33	4200	M6.09
10119780801	4705.88	0.01	M 31	M 650	5.8	M 9.5	16	M 0	27	M16.5	M 61	M7099	3.60
10119780808	43484.79	2.80	32	300	5.8	1.0	283	0	480	17.0	90	9999	3.42
10119780814	35209.49	0.26	M 30	M 292	5.9	M 1.4	11	M 0	13	M16.1	M 86	M9480	3.00
10119780823	52934.24	0.67	M 28	M 283	6.1	M 1.7	M 40	M 0	M 40	M15.3	M 82	M9035	1.76
10119780829	5881.58	0.47	M 26	M 273	5.0	M 2.2	85	M 0	81	M14.2	M 77	M8367	4.34
10119780905	3.40	M .54	M 24	M 260	M 6.0	M 2.5	M 105	M 0	M 99	M13.4	M 73	M7922	M4.16
10119780912	0.00	M .62	M 22	M 261	M 6.0	M 2.9	M 129	M 0	M 120	M12.5	M 69	M7403	M3.95
10119780919	0.00	M .70	M 20	M 234	M 6.0	M 3.3	M 153	M 0	M 141	M11.6	M 65	M6884	M3.74
10119780926	0.00	M .78	M 19	M 247	M 6.0	M 3.7	M 177	M 0	M 162	M10.7	M 61	M6365	M3.53
10119781003	0.00	M .86	M 18	M 240	M 6.0	M 4.1	M 201	M 0	M 183	M 9.9	M 57	M5846	M3.32
10119781010	0.00	M .95	M 17	M 233	M 6.0	M 4.5	M 225	M 0	M 204	M 9.0	M 53	M5327	M3.11
10119781017	0.00	M1.04	M 16	M 226	M 6.0	M 4.9	M 249	M 0	M 225	M 8.2	M 49	M4808	M2.90
10119781025	0.00	M1.13	M 15	M 219	M 6.0	M 5.4	M 273	M 0	M 246	M 7.4	M 45	M4289	M2.69
10119781031	0.00	M1.23	M 13	M 211	M 6.0	M 5.9	M 300	M 0	M 270	M 6.5	M 40	M3696	M2.45
10119781109	0.00	M1.30	M 12	M 205	M 6.0	M 6.3	M 321	M 0	M 288	M 5.8	M 37	M3231	M2.27
10119781114	0.00	M1.42	M 10	M 196	M 6.0	M 6.9	M 352	M 0	M 315	M 4.7	M 32	M2584	M2.00
10119781121	373.13	M1.48	M 9	M 191	M 6.0	M 7.3	M 369	M 0	M 330	M 4.1	M 29	M2214	M1.83
10119781128	0.00	M1.57	M 8	M 184	M 6.0	M 7.8	M 394	M 0	M 352	M 3.3	M 26	M1696	M1.65
10119781205	8066.82	1.68	M 8	M 177	6.0	M 8.4	420	M 0	378	M 2.5	M 23	M1178	1.46
10119781213	13983.41	1.49	08	170	6.4	9.0	75	M 0	75	1.9	20	660	2.94
10119781219	1451.14	.95	M 6	M 152	6.1	M 9.4	82	M 0	90	M 2.8	M 13	M1254	1.76
10119781228	60656.94	1.07	05	140	5.8	9.8	12	0	56	3.5	9	1700	1.93
10119790104	34818.93	1.57	M 6	M 123	6.1	M 7.9	14	M 0	26	M 2.9	M 527	M1756	2.16

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10119780110	16908.23	<.1	.06	46	22.6	M11.7	M .0	M10.8	M 2.5	M .01	M 4.0	M .03	M .05	M .00
10119780117	28088.30	.2	.08	32	9.4	M11.2	M .0	M 9.8	M 2.3	M .01	M 4.0	M .02	M .04	M .00
10119780124	272093.75	.4	.08	23	5.1	M10.6	M .0	M 8.4	M 2.0	M .01	M 4.0	M .01	M .03	M .00
10119780131	100582.63	.4	.12	41	6.9	M10.0	M .0	M 7.0	M 1.8	M .01	M 4.0	M .01	M .02	M .00
10119780207	10836.69	<.1	.04	48	13.5	9.5	0.0	5.6	1.7	.02	4.0	.02	.02	.00
10119780216	13932.89	.3	.06	36	11.8	M 9.5	M .0	M 6.0	M 1.7	M .02	M 3.3	M .01	M .05	M .00
10119780224	24654.11	.2	.14	22	12.5	M 9.6	M .0	M 6.5	M 1.7	M .02	M 2.4	M .01	M .09	M .00
10119780228	7710.81	.5	.06	34	12.6	M 9.7	M .0	M 7.0	M 1.7	M .02	M 1.7	M .01	M .12	M .00
10119780308	38484.63	.4	.02	22	9.8	9.8	0.0	7.3	1.8	.03	1.4	.02	.15	.00
10119780314	64768.21	.3	.04	22	7.6	M10.8	M .3	M 6.4	M 1.6	M .02	M 2.3	M .01	M .12	M .00
10119780321	18236.25	.2	.07	44	8.6	M11.5	M .5	M 5.7	M 1.5	M .01	M 3.0	M .01	M .10	M .00
10119780329	27840.48	.2	.06	69	10.0	M12.4	M .8	M 4.9	M 1.4	M .00	M 3.8	M .01	M .08	M .00
10119780405	5041.81	.5	.04	72	11.2	13.5	1.2	4.2	1.4	.00	4.8	.01	.07	.00
10119780412	1207.07	M .5	M .05	M 68	M11.4	M13.8	M .9	M 4.4	M 1.4	M .00	M 5.2	M .91	M .08	M .00
10119780419	608.94	.6	.07	64	11.8	M14.1	M .6	M 4.6	M 1.4	M .00	M 5.7	M .01	M .09	M .00
10119780425	1358.11	.1	.08	58	12.6	M14.4	M .4	M 4.8	M 1.4	M .00	M 6.2	M .02	M .10	M .00
10119780427	14228.02	.4	.04	35	8.6	M14.6	M .2	M 5.0	M 1.5	M .00	M 6.6	M .03	M .11	M .00
10119780502	15247.69	.9	.08	48	11.0	14.8	0.2	5.1	1.5	.01	M 6.7	.04	.12	.00
10119780510	90005.38	.2	.04	40	7.8	M14.8	M .5	M 5.8	M 1.6	M .01	M 7.0	M .03	M .12	M .00
10119780516	75103.31	.1	.02	34	9.6	M14.8	M 1.0	M 6.9	M 1.7	M .01	M 7.6	M .02	M .12	M .00
10119780522	75103.31	.3	.07	68	9.5	M14.8	M 1.4	M 7.8	M 1.8	M .01	M 8.0	M .01	M .12	M .00
10119780529	15060.73	.3	.15	72	9.8	M14.8	M 1.9	M 8.7	M 1.9	M .01	M 8.5	M .01	M .12	M .00
10119780606	154127.19	.9	.17	82	7.7	15.0	2.5	9.8	2.2	.02	9.1	.02	.13	.00
10119780614	107934.50	1.3	.24	84	4.8	M19.0	M 4.5	M10.0	M 3.1	M .01	M 7.9	M .02	M .11	M .00
10119780620	21590.91	M 7.4	M2.55	M 89	M43.1	M23.0	M 6.5	M26.2	M 4.0	M .01	M 6.7	M .03	M .09	M .00
10119780628	1374.14	12.0	4.29	93	72.0	M26.0	M 8.0	M32.3	M 4.7	M .01	M 5.8	M .03	M .08	M .00
10119780705	302.81	M10.0	M3.32	M 63	M61.0	M30.1	M10.1	M40.5	M 5.6	M .01	M 4.6	M .04	M .07	M .00
10119780712	16399.79	M 8.3	M2.47	38	M51.4	M33.7	M11.9	M47.7	M 6.4	M .01	M 3.5	M .05	M .06	M .00
10119780718	9321.37	M 6.6	M1.62	M 38	M41.9	M37.3	M13.7	M54.9	M 7.2	M .01	M 2.4	M .06	M .05	M .00
10119780725	5567.83	M 5.2	M .89	M 38	M33.7	M40.3	M15.3	M61.0	M 7.9	M .01	M 1.5	M .07	M .04	M .00
10119780801	4795.88	3.6	.05	40	124.3	44.0	17.2	68.3	8.8	.01	0.6	.09	.04	.00
10119780808	43484.79	1.5	.12	102	41.0	M42.3	M17.0	M65.5	M 8.6	M .01	M 1.2	M .08	M .04	M .00
10119780814	33289.49	0.3	.11	44	19.5	M40.6	M16.8	M62.7	M 8.4	M .01	M 1.8	M .07	M .04	M .00
10119780823	52934.24	<.1	.13	42	22.5	M39.1	M16.7	M60.3	M 8.2	M .01	M 2.3	M .06	M .04	M .00
10119780829	5881.58	0.6	.25	88	28.4	M36.9	M16.5	M56.7	M 8.0	M .01	M 3.2	M .06	M .04	M .00
10119780905	3.40	M .5	M .24		M28.6	M35.4	M16.4	M54.3	M 7.8	M .01	M 3.8	M .06	M .04	M .00
10119780912	0.00	M .4	M .23		M28.8	M33.7	M16.3	M51.8	M 7.6	M .01	M 4.5	M .06	M .04	M .00
10119780919	0.00	M .3	M .22		M29.0	M32.0	M16.2	M48.7	M 7.4	M .01	M 5.2	M .06	M .04	M .00
10119780926	0.00	M .3	M .21		M29.2	M30.3	M16.1	M45.9	M 7.2	M .01	M 5.9	M .06	M .04	M .00
10119781003	0.00	M .3	M .20		M29.4	M28.6	M16.0	M43.2	M 7.0	M .01	M 6.6	M .06	M .04	M .00
10119781010	0.00	M .3	M .19		M29.6	M26.9	M15.9	M40.5	M 6.9	M .01	M 7.3	M .06	M .04	M .00
10119781017	0.00	M .3	M .18		M29.8	M25.2	M15.8	M37.8	M 6.8	M .01	M 8.0	M .06	M .04	M .00
10119781025	0.00	M .3	M .18		M30.0	M23.5	M15.7	M35.1	M 6.7	M .01	M 8.7	M .06	M .04	M .00
10119781031	0.00	M .3	M .18		M30.3	M21.6	M15.6	M32.0	M 6.6	M .01	M 9.5	M .06	M .04	M .00
10119781109	0.00	M .3	M .18		M30.5	M20.2	M15.5	M29.7	M 6.5	M .01	M10.1	M .06	M .04	M .00
10119781114	0.00	M .3	M .18		M30.9	M18.2	M15.4	M26.2	M 6.4	M .01	M11.0	M .06	M .04	M .00
10119781121	373.13	M .3	M .18		M31.1	M17.0	M15.3	M24.3	M 6.3	M .01	M11.5	M .06	M .04	M .00
10119781128	0.00	M .3	M .18		M31.4	M15.5	M15.2	M21.6	M 6.2	M .02	M12.2	M .06	M .05	M .00
10119781205	8066.82	.3	.18		31.9	14.0	15.2	19.0	6.2	.04	13.0	.07	.07	.00
10119781213	13983.41	<.1	.12		34.8	M13.7	M12.1	M18.8	M 6.0	M .03	M11.0	M .06	M .06	M .00
10119781219	1451.14	<.1	.07		34.4	M13.4	M 8.6	M18.6	M 5.8	M .02	M 8.8	M .05	M .05	M .00
10119781228	60656.94	.2	.04		31.3	M13.2	M 6.0	M18.5	M 3.7	M .02	M 7.1	M .05	M .05	M .00
10119790104	34818.93	<.1	.04		30.8	13.0	2.3	18.5	5.7	.03	4.7	.06	.05	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10119790109	76081.13	.50	07	110	5.8	6.5	15	0	17	2.6	930	1800	.64
10119790116	106513.50	0.92	M 7	M 118	5.7	M 7.4	24	M 0	62	M 2.0	M 842	M1345	1.62
10119790123	106513.50	0.52	08	130	6.0	8.9	59	0	60	1.2	0	710	1.82
10119790130	25488.23	0.54	M 5	M 120	6.4	M10.5	24	M 0	162	M 1.3	M 0	M 420	0.87
10119790206	3046.20	0.36	02	110	6.5	12.3	33	0	36	1.5	0	130	1.15
10119790213	4981.96	0.49	M 4	M 108	6.2	M10.2	60	M 0	270	M 1.8	M 33	M 157	1.54
10119790222	14150.67	1.13	M 6	M 106	5.2	M 8.1	10	M 0	24	M 2.1	M 66	M 184	1.51
10119790227	98441.81	1.89	10	105	5.3	5.3	15	0	75	2.5	110	220	1.60
10119790307	28008.63	1.74	M 12	M 106	5.6	M 7.0	4	M 0	42	M 3.0	M 68	M 149	2.04
10119790313	27607.77	0.87	16	110	6.1	9.5	22	0	62	4.0	3	37	2.46
10119790320	5943.38	0.20	M 15	M 110	6.6	M 8.7	28	M 0	83	M 4.4	M 66	M 107	0.95
10119790327	5036.45	0.34	13	110	6.2	7.8	63	0	150	5.0	140	190	2.16
10119790405	3853.99	0.68	M 16	M 125	6.0	M 8.5	30	M 0	92	M 4.2	M 96	M 140	2.07
10119790411	4653.09	0.49	18	143	6.4	9.5	50	M 0	86	3.3	40	77	.84
10119790417	7391.20	1.40	M 18	M 147	6.3	M 8.0	26	M 0	122	M 3.9	M 455	M 438	1.15
10119790424	1263.18	.39	19	150	6.3	6.3	40	M 0	52	4.5	870	800	.62
10119790501	6838.55	.92	M 19	M 360	6.5	M 6.3	45	M 0	130	M 4.3	M 431	M1100	1.71
10119790508	1340.55	3.16	20	570	6.5	6.5	38	0	14	4.1	33	1400	11.4
10119790516	27439.42	M3.41	M 20	M 537	M 6.5	M 6.0	M 29	M 0	M 29	M 4.7	M4683	M5412	M 9.6
10119790522	81724.00	13.70	22	500	6.5	5.5	19	0	48	5.5	9999	9999	7.73
10119790529	28654.84	9.60	M 24	M 433	6.2	M 7.2	12	M 0	72	M 9.4	M5388	M6399	3.78
10119790606	43896.35	5.70	28	400	5.8	9.2	10	0	5	14.0	10	2200	3.07
10119790612	2145.67	1.40	M 27	M 372	6.8	M 8.9	13	M 0	26	M 8.8	M1640	M1850	2.36
10119790619	589.62	1.04	M 26	M 351	M 6.8	M 8.7	M 16	M 0	M 22	5.0	M2063	M1588	8.08
10119790626	0.00	M5.33	M 26	M 326	M 6.9	M 8.5	M 20	M 0	M 18	M 4.0	M4290	M1282	M6.33
10119790703	17017.72	9.64	M 26	M 302	7.1	M 8.3	24	M 0	14	M 4.6	M5717	M 976	24.6
10119790710	25326.57	11.30	M 26	M 278	6.5	M 8.1	M 16	M 0	M 22	M 4.4	M7144	M 670	18.5
10119790717	0.00	M2.42	M 26	M 254	M 6.6	M 7.9	M 8	M 0	M 30	M 4.3	M8371	M 363	M16.8
10119790723	13076.34	3.55	26	230	6.8	7.9	1	0	39	4.2	9999	60	15.1

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	F	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10119790109	76081.13	<.1	.07		10.5	M13.4	M 2.4	M17.2	M 5.3	M .02	M 4.3	M .05	M .09	M .00
10119790116	106513.50	.4	.04		21.9	M13.7	M 2.5	M16.3	M 5.0	M .02	M 4.0	M .04	M .12	M .00
10119790123	106513.50	.2	.12		19.1	M14.1	M 2.6	M15.1	M 4.6	M .02	M 3.7	M .04	M .16	M .00
10119790130	25488.23	.2	.08		20.1	M14.6	M 2.8	M13.9	M 4.3	M .02	M 3.4	M .04	M .21	M .00
10119790206	3046.20	<.1	.04		21.6	15.2	3.0	12.8	4.1	.03	3.2	.04	.27	.00
10119790213	4981.96	.1	.04		19.7	M13.1	M 2.3	M12.2	M 3.7	M .02	M2.72	M .03	M .20	M .00
10119790222	14150.67	.2	.05		19.6	M11.0	M 1.6	M11.6	M 3.4	M .01	M2.24	M .02	M .13	M .00
10119790227	98441.81	.2	.04		17.6	M 8.4	M .8	M10.9	M 3.0	M .01	M1.63	M .02	M .04	M .00
10119790307	28008.63	.2	.03		14.7	7.0	.5	10.6	2.8	.02	1.3	.03	.00	.00
10119790313	27607.77	<.1	.17		15.2	M 7.8	M 1.3	M10.3	M 2.9	M .01	M2.75	M .02	M .00	M .00
10119790320	5943.38	<.1	.03		16.3	M 8.4	M 1.9	M10.0	M 3.0	M .00	M3.84	M .01	M .00	M .00
10119790327	5036.45	.2	.10		15.5	M 9.1	M 2.6	M 9.8	M 3.2	M .00	M5.11	M .01	M .00	M .00
10119790405	3853.99	.1	.08		14.6	10.0	3.5	9.6	3.5	.00	6.4	.02	.00	.00
10119790411	4653.09	<.1	.06		13.7	M11.1	M 3.0	M10.3	M 3.6	M .00	M5.46	M .01	M .00	M .00
10119790417	7391.20	<.1	.06		11.7	M11.8	M 2.6	M10.8	M 3.7	M .00	M4.84	M .01	M .00	M .00
10119790424	1263.18	<.1	.05		13.3	M12.5	M 2.3	M11.3	M 3.8	M .01	M4.22	M .01	M .00	M .00
10119790501	6838.55	<.1	.08		13.7	13.5	2.0	12.0	4.0	.03	3.3	.02	.02	.00
10119790508	1340.55	9.2	1.30		55.9	M13.7	M 2.1	M12.4	M 4.2	M .03	M3.32	M .02	M .02	M .00
10119790516	27439.42	M 6.7	M .80		M43.9	M13.9	M 2.2	M12.8	M 4.4	M .03	M3.14	M .02	M .02	M .00
10119790522	81724.00	3.9	.23		M34.6	M14.2	M 2.3	M13.3	M 4.7	M .03	M2.93	M .03	M .02	M .00
10119790529	28654.84	.2	.17		26.2	M14.4	M 2.4	M13.7	M 4.9	M .03	M2.77	M .03	M .02	M .00
10119790606	43896.35	<.1	.12		56.2	M14.6	M 2.5	M14.1	M 5.2	M .03	M2.59	M .04	M .02	M .00
10119790612	2145.67	<.1	.12		36.9	M14.9	M 2.6	M14.6	M 5.5	M .03	M2.38	M .05	M .03	M .00
10119790619	589.62	<.1	.06		38.8	M15.1	M 2.7	M15.0	M 5.7	M .03	M2.22	M .06	M .03	M .00
10119790626	0.00	M 7.0	M .07		M33.0	M15.4	M 2.8	M15.5	M 6.0	M .04	M2.04	M .07	M .04	M .00
10119790703	17017.72	14.0	.09		M27.3	M15.7	M 3.0	M16.0	M 6.3	M .05	M1.86	M .08	M .05	M .00
10119790710	25326.57	15.5	.08		21.6	M16.0	M 3.2	M16.5	M 6.6	M .06	M1.68	M .09	M .06	M .00
10119790717	0.00	M13.7	M .11		M22.1	M16.3	M 3.4	M17.0	M 6.9	M .07	M1.51	M .10	M .07	M .00
10119790723	13076.34	12.0	.16		22.8	M16.6	M 3.6	M17.5	M 7.2	M .08	M1.34	M .11	M .08	M .00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10219760714	17651.20	.12	22	70	4.9	5.7	<25	0	30	2.6	0	140	1.63
10219760724	2944.77	M .08	M 24	M 95	M 5.4	M 5.9	M 25	M 0	M 52	M 5.9	M 0	M 320	M2.08
10219760727	313.47	C .06	27	120	5.9	6.2	<25	0	75	9.3	1	500	2.52
10219760803	2552.97	C .08	24	80	5.9	M 5.1	<25	0	87	M 6.9	M 4	M 573	2.32
10219760810	7102.25	.72	24	90	6.2	3.9	M 39	0	11	4.2	0	660	3.50
10219760817	15600.05	.22	M 24	M 95	6.2	M 4.4	M 53	M 0	161	M 5.7	M 4	M 366	1.34
10219760824	3594.05	.12	24	100	6.4	4.9	M 67	0	21	7.3	0	73	1.34
10219760831	413.54	.02	20	85	6.7	M 5.2	M 81	0	20	M 6.8	M 3	M 207	1.76
10219760907	0.00	M .16	18	78	M 6.7	5.6	M 95	0	M 13	M 6.3	M 6	M 341	M1.57
10219760916	0.00	.31	22	45	6.8	M 4.9	110	0	7	M 5.8	M 10	M 476	1.40
10219760922	3866.18	.35	20	60	6.7	4.1	70	0	32	5.2	16	650	1.60
10219760928	1297.11	.18	22	60	6.8	M 5.5	<25	0	7	M 4.0	M 10	M 635	1.51
10219761005	2345.32	.02	18	50	6.8	7.0	M 36	6	8	2.9	4	620	1.01
10219761012	965.11	.02	M 15	M 72	6.6	M 6.9	M 50	M 0	M 18	M 2.6	M 3	M 530	1.09
10219761019	0.00	C .06	12	95	5.5	M 6.8	63	0	16	M 2.4	M 2	M 440	1.15
10219761026	3114.76	.04	23	40	5.6	6.8	65	0	19	2.2	1	350	1.20
10219761102	1840.32	.03	9	30	6.5	M 7.9	41	0	9	M 2.7	M 0	M 173	0.98
10219761109	1050.40	.01	5	20	5.9	9.1	85	0	11	3.3	0	0	0.62
10219761115	0.43	.00	8	35	6.5	M 8.3	57	0	29	M 2.6	M 0	M 6	1.12
10219761122	7486.97	.24	6	45	5.5	7.8	<23	0	12	2.1	0	12	0.64
10219761130	8057.04	.06	13	30	6.0	9.5	<25	0	16	M 1.8	0	270	0.56
10219761207	6573.28	.35	13	30	5.8	9.5	<25	M 0	15	1.6	M 185	M 644	0.87
10219761214	36717.40	1.69	3	25	5.4	M 8.7	<25	0	19	M 1.5	M 347	M 972	0.90
10219761220	56598.91	.20	9	60	4.2	M 7.9	<25	0	8	1.6	810	1300	1.20
10219761229	36300.82	1.15	8	50	4.2	M 7.3	<25	0	7	M 1.3	M 306	M 801	0.81
10219770105	32645.82	.41	8	35	4.2	6.8	<23	0	7	1.1	0	53	0.73

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10219760714	17651.20	0.2	.04	32	7.8	M 7.1	M 1.1	M 2.1	M 1.6	M .00	M12.0	M .03	M .03	M .00
10219760721	2944.77	M .1	M .07	M 49	M 9.8	M 8.8	M 1.0	M 2.4	M 1.6	M .00	M22.4	M .02	M .02	M .00
10219760727	313.47	<.1	.12	66	11.9	M10.5	M 1.0	M 2.7	M 1.8	M .00	M32.9	M .01	M .01	M .00
10219760803	2552.97	<.1	.14	57	11.9	12.0	1.0	3.0	2.0	.00	42.0	.01	.01	.00
10219760810	7102.25	<.1	.13	64	12.3	M11.4	M 1.2	M 3.4	M 1.9	M .00	M36.6	M .00	M .01	M .00
10219760817	15600.05	<.1	.04	26	7.8	M10.8	M 1.4	M 3.9	M 1.9	M .00	M31.2	M .00	M .01	M .00
10219760824	3594.05	<.1	.08	47	10.9	M10.2	M 1.6	M 4.4	M 1.9	M .00	M25.9	M .00	M .01	M .00
10219760831	413.54	<.1	.13	50	12.3	M 9.6	M 1.8	M 4.9	M 1.9	M .00	M20.5	M .00	M .01	M .00
10219760907	0.00	M .0	M .10	M 41	M10.8	M 9.0	M 2.1	M 5.4	M 1.9	M .00	M15.2	M .00	M .01	M .00
10219760916	0.00	<.1	.08	33	9.4	8.5	2.5	6.0	1.9	.00	10.0	.00	.01	.00
10219760922	3866.18	.1	.14	38	5.9	M 7.2	M 2.0	M 4.3	M 1.6	M .00	M 9.3	M .00	M .01	M .00
10219760928	1297.11	.4	.04	27	6.0	M 6.3	M 1.7	M 3.2	M 1.4	M .01	M 8.9	M .00	M .01	M .00
10219761005	2345.32	.2	.05	22	8.8	5.5	1.5	2.2	1.4	.02	8.5	.00	.01	.00
10219761012	965.11	<.1	.04	30	7.3	M 3.3	M 1.5	M 2.0	M 1.4	M .01	M 7.7	M .00	M .01	M .00
10219761019	0.00	<.1	.14	26	11.6	M 5.1	M 1.5	M 1.9	M 1.4	M .01	M 6.9	M .00	M .01	M .00
10219761026	3114.76	<.1	.06	28	7.4	M 5.0	M 1.5	M 1.8	M 1.4	M .01	M 6.1	M .00	M .01	M .00
10219761102	1840.32	<.1	.06	23	6.0	5.0	1.5	1.8	1.4	.01	5.5	.00	.01	.00
10219761109	1050.40	<.1	.05	16	7.3	M 5.0	M 1.4	M 1.8	M 1.4	M .00	M 5.0	M .00	M .01	M .00
10219761115	0.43	<.1	.08	18	6.8	M 5.1	M 1.3	M 1.8	M 1.4	M .00	M 4.5	M .00	M .01	M .00
10219761122	7486.97	<.1	.03	13	7.4	M 5.2	M 1.2	M 1.8	M 1.4	M .00	M 4.1	M .00	M .01	M .00
10219761130	8057.04	<.1	.07	18	7.2	M 5.3	M 1.1	M 1.8	M 1.4	M .00	M 3.6	M .00	M .01	M .00
10219761207	6573.28	<.1	.09	26	7.1	5.5	1.0	1.8	1.4	.00	3.2	.01	.01	.00
10219761214	36717.40	<.1	.02	23	8.4	M 5.6	M 1.0	M 1.8	M 1.5	M .00	M 3.0	M .01	M .00	M .00
10219761220	56598.91	<.1	.43	50	13.7	M 5.7	M 1.0	M 1.8	M 1.6	M .00	M 2.8	M .01	M .00	M .00
10219761229	36300.82	<.1	.03	23	8.2	M 5.8	M 1.0	M 1.9	M 1.8	M .00	M 2.6	M .01	M .00	M .00
10219770105	32645.82	<.1	.02	27	7.4	6.0	1.0	2.1	2.1	.00	2.4	.03	.00	.00

Appendix D (Cont'd)

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CONCENTRATION TABLE
ST. DATE    FLOW VOLUME  NO3-N    T C   COND     PH    D.O   TURB    SAL    F.S    BOD  COL-F  COL-T    TKN
10219770113    40713.32    .42      5     35    4.0  M 5.8    <25      0  M   7  M 1.9  M  22  M  44   0.00
10219770119    41995.57    .00  M   3  M  38    4.2    5.0    <25      0      8  M 2.9     48  M  34   0.48
10219770126    34146.76    .11  M   2  M  41    4.6    3.7    <25  M   0      7  M 3.7  M  23  M  27   0.36
10219770131    15760.60  C .08      2     45    5.0    7.0    <25      0     21    4.7      0     20   0.64
10219770207    13306.93    .03      5     80    4.0    5.7    <25      0  M  16  M 3.7      0     36   0.36
10219770216    10397.08    .06      4  M  80    5.2    8.0    <25  M   0     11    2.5      0     45   0.48
10219770224     6318.17    .06     -2     80    5.4    6.3     33      0     45  M 1.8  M   0  M  79   0.80
10219770302    17195.37    .07      7     60    5.2    6.4     30      0     37    1.2      0    110   0.50
10219770310    32620.86    .17  M   9  M  60    4.4  M 6.5    <25  M   0     18  M 1.4  M   0  M 247   0.56
10219770317    51393.06    .23     12     60    5.5    6.8     40      0     70    1.8      0    430   0.76
10219770323    42158.83    .14  M  16  M  70    4.2  M 6.1    <25  M   0      4  M 3.6  M   6  M 325   0.62
10219770401    43031.90    .00     20     80    4.9    5.6    <25      0     33  M 5.2  M  11  M 235   1.12
10219770406     8931.42    .08     20     65    5.4    6.8    160      0    501    7.7     21    100   0.84
10219770413     7324.59    .10  M  20  M  83    5.6  M 5.9     91  M   0    111  M 7.3  M  12  M 174   1.40
10219770420     3308.03    .15     22    110    5.7    4.7     87      0     85    6.9      0    280   0.48
10219770427     3619.10    .10  M  24  M 107    5.4  M 5.5    160  M   0    195  M 7.2  M   4  M 400   2.18
10219770504     1805.51    .12     26    105    5.5    6.5    118      0    133    7.6      9    520   2.61
10219770511     1003.01    .11  M  27  M  94    5.2  M 6.7    115  M   0     84  M 6.7  M   9  M 553   2.38
10219770519      119.20    .06  M  29  M  83  M 5.0  M 6.9  M  92  M   0  M  60  M 5.8  M   9  M 587   2.51
10219770526       36.31    .23  M  31  M  70    4.9  M 7.2     66  M   0     34  M 4.7  M  10  M 625   1.43
10219770601     3325.13    .07     34     60    5.3    7.6     82      0    121    3.9     11    660    .84
10219770607      638.90    .00  M  33  M  61  M 5.2  M 7.6  M  76  M   0  M 113  M 3.8  M  12  M 625   1.05
10219770614        0.00  M .00  M  32  M  62  M 5.1  M 7.6  M  70  M   0  M 105  M 3.7  M  13  M 590  M1.20
10219770621        0.00  M .00  M  31  M  63  M 5.0  M 7.7  M  64  M   0  M  96  M 3.6  M  14  M 549  M1.38
10219770629        0.00  M .00  M  30  M  64  M 4.9  M 7.8  M  58  M   0  M  87  M 3.5  M  15  M 508  M1.56
10219770706        0.00  M .00  M  29  M  66  M 4.8  M 7.9  M  51  M   0  M  77  M 3.4  M  16  M 461  M1.77
10219770713        0.00  M .00  M  28  M  67  M 4.7  M 8.0  M  45  M   0  M  68  M 3.3  M  17  M 420  M1.95
10219770721        0.00  M .00  M  27  M  69  M 4.6  M 8.1  M  39  M   0  M  60  M 3.2  M  18  M 380  M2.13
10219770726        0.00  M .00  M  26  M  71  M 4.5  M 8.2  M  32  M   0  M  50  M 3.1  M  20  M 334  M2.34
10219770802        0.00  M .00  M  26  M  72  M 4.5  M 8.3  M  28  M   0  M  44  M 3.0  M  21  M 305  M2.47
10219770810        0.00  M .00  M  26  M  74  M 4.5  M 8.4  M  22  M   0  M  36  M 3.0  M  23  M 265  M2.66
10219770817        0.00  M .00  M  26  M  77  M 4.5  M 8.6  M  16  M   0  M  27  M 3.0  M  25  M 219  M2.88
10219770822     9489.29    .00     26     80    4.6    8.8     11      0     20    3.0     28    180   3.08
10219770830     2674.68    .00  M  25  M  77    4.6  M 8.6     08  M   0     08  M 3.0  M  21  M 182    .28
10219770906       48.43    .03  M  23  M  73    6.6  M 8.3  M   8  M   0  M  13  M 3.1  M  11  M 186   0.70
10219770913     2884.02    .03     23     70    5.3    8.2      9      0     18    3.3      3    190   0.84
10219770920      242.28    .06  M  21  M  64    5.9  M 8.7  M  47  M   0  M  15  M 2.8  M  14  M 168   2.10
10219770927        0.00  M .09  M  19  M  58  M 5.6  M 9.2  M  83  M   0  M  13  M 2.4  M  25  M 147  M4.07
10219771004        0.00  M .13  M  17  M  52  M 5.4  M 9.8  M 123  M   0  M  11  M 2.0  M  36  M 126  M6.04
10219771011        0.00  M .17  M  15  M  46  M 5.1  M10.4  M 161  M   0  M   9  M 1.6  M  48  M 105  M8.01
10219771018       14.87    .22     13     40    5.0   11.0    200      0      7    1.3     61     84   10.0
10219771025       46.02  M .36  M  18  M  62  M 4.6  M 9.6  M 103  M   0  M   5  M 1.5  M  30  M  46  M 7.3
10219771103    22182.90    .51     23     85    4.4    8.2      7      0      4    1.9      0      8   4.79
10219771108    13927.41    .36  M  15  M  75    3.9  M 9.8      2  M   0      2  M 2.9  M   0  M  13   0.95
10219771115    63439.68    .13     11     70    4.8   10.8      4      0     54    3.6      0     16   0.70
10219771122    15125.89    .12  M  12  M  67    4.7  M11.1      3  M   0      7  M 2.9  M   0  M  12   0.48
10219771129     8890.94    .00     14     65    5.1   11.5     54      0     17    2.2      0      8   0.31
10219771206     7560.29    .10  M   9  M  55    5.0  M11.5      7  M   0     33  M 1.5  M   0  M  12   0.34
10219771212     6505.80    .14      4     45    5.1   11.5      4      0     20    1.0      0     17   0.25
10219771220    10225.91    .14  M   4  M  56    4.6  M10.8      3  M   0     14  M 1.0  M   0  M  29   0.62
10219771230    36702.62  C .13  M   4  M  71    4.7  M 9.9      4  M   0      7  M 1.1  M   0  M  45   0.67
10219780105    41004.63    .00      5     90    4.3    8.8      2      0      3    1.3      0     67   1.37
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10219770113	40713.32	<.1	.01	26	8.9	M 6.7	M 1.0	M 1.9	M 1.8	M .00	M 2.4	M .02	M .00	M .00
10219770119	41995.57	<.1	.01	24	10.1	M 7.5	M 1.0	M 1.6	M 1.5	M .00	M 2.5	M .01	M .00	M .00
10219770126	34146.76	<.1	.01	20	8.8	M 8.1	M 1.0	M 1.4	M 1.3	M .00	M 2.5	M .00	M .00	M .00
10219770131	15760.60	<.1	.03	29	10.3	M 8.8	M 1.0	M 1.2	M 1.1	M .00	M 2.6	M .00	M .00	M .00
10219770207	13306.93	<.1	.02	28	9.2	9.4	1.0	1.2	1.0	.00	2.8	.00	.00	.00
10219770216	10397.08	<.1	.04	32	10.7	M 8.8	M .7	M 1.4	M 1.0	M .00	M 4.2	M .00	M .00	M .00
10219770224	6318.17	<.1	.06	36	11.1	M 8.1	M .3	M 1.6	M 1.0	M .00	M 6.0	M .00	M .01	M .00
10219770302	17195.57	<.1	.01	32	11.2	7.5	0.0	1.9	1.0	.00	7.7	.00	.03	.00
10219770310	32620.86	<.1	.03	28	9.2	M 7.8	M .0	M 1.7	M .9	M .00	M 7.1	M .00	M .05	M .00
10219770317	51593.06	<.1	.18	19	7.2	M 8.2	M .1	M 1.5	M .8	M .00	M 6.4	M .01	M .08	M .00
10219770323	42158.83	<.1	.01	20	8.2	M 8.6	M .2	M 1.4	M .7	M .00	M 5.8	M .02	M .11	M .00
10219770401	43031.98	<.1	.11	25	9.8	9.0	0.3	1.4	0.7	.00	5.4	.03	.14	.00
10219770406	8931.42	<.1	.04	28	8.5	M 9.5	M 1.6	M 1.9	M 1.1	M .00	M16.0	M .02	M .11	M .00
10219770413	7324.59	<.1	.06	35	11.2	M 9.8	M 2.3	M 2.2	M 1.3	M .00	M21.9	M .01	M .09	M .00
10219770420	3308.03	<.1	.07	86	13.4	M10.2	M 3.3	M 2.6	M 1.6	M .00	M30.1	M .01	M .06	M .00
10219770427	3619.10	<.1	.07	101	12.6	M10.6	M 4.3	M 3.0	M 1.9	M .00	M38.4	M .01	M .04	M .00
10219770504	1805.51	<.1	.09	106	12.3	11.2	5.4	3.5	2.4	.00	46.7	.02	.03	.00
10219770511	1003.01	.1	.12	85	12.4	M12.5	M 4.3	M 2.9	M 2.0	M .00	M36.9	M .01	M .02	M .00
10219770519	119.20	<.1	.13	75	13.1	M13.8	M 3.2	M 2.3	M 1.6	M .00	M27.2	M .00	M .01	M .00
10219770526	36.31	<.1	.05	31	5.3	M13.3	M 2.0	M 1.7	M 1.2	M .00	M16.1	M .00	M .01	M .00
10219770601	3323.13	<.1	.05	28	5.8	16.8	1.1	1.3	1.0	.00	6.5	.00	.02	.00
10219770607	638.90	<.1	.08	40	6.2	M16.0	M 1.1	M 1.4	M 1.0	M .00	M 6.1	M .00	M .02	M .00
10219770614	0.00	M .1	M .08	M 38	M 6.0	M15.2	M 1.1	M 1.5	M 1.0	M .00	M 5.7	M .00	M .02	M .00
10219770621	0.00	M .1	M .08	M 36	M 5.8	M14.3	M 1.1	M 1.6	M 1.0	M .00	M 5.2	M .00	M .02	M .00
10219770629	0.00	M .1	M .08	M 34	M 5.6	M13.4	M 1.1	M 1.7	M 1.0	M .00	M 4.7	M .00	M .02	M .00
10219770706	0.00	M .2	M .08	M 32	M 5.4	M12.4	M 1.1	M 1.8	M 1.0	M .00	M 4.2	M .00	M .02	M .00
10219770713	0.00	M .3	M .08	M 30	M 5.3	M11.5	M 1.1	M 1.9	M 1.0	M .00	M 3.7	M .00	M .02	M .00
10219770721	0.00	M .4	M .08	M 28	M 5.2	M10.6	M 1.1	M 2.0	M 1.0	M .00	M 3.3	M .00	M .02	M .00
10219770726	0.00	M .5	M .08	M 26	M 5.1	M 9.6	M 1.1	M 2.1	M 1.0	M .00	M 2.8	M .00	M .02	M .00
10219770802	0.00	M .5	M .08	M 25	M 5.0	M 8.9	M 1.1	M 2.2	M 1.0	M .00	M 2.5	M .00	M .02	M .00
10219770810	0.00	M .6	M .08	M 24	M 4.9	M 8.0	M 1.1	M 2.4	M 1.0	M .00	M 2.1	M .00	M .02	M .00
10219770817	0.00	M .8	M .09	M 22	M 4.8	M 7.0	M 1.2	M 2.6	M 1.1	M .00	M 1.6	M .00	M .02	M .00
10219770822	9489.29	1.0	.10	22	4.8	M 6.2	M 1.3	M 2.8	M 1.2	M .00	M 1.2	M .00	M .03	M .00
10219770830	2674.68	<.1	.02	16	3.7	M 5.6	M 1.3	M 2.9	M 1.2	M .00	M .9	M .00	M .03	M .00
10219770906	48.43	0.2	.02	14	3.3	4.8	1.5	3.2	1.4	.00	0.6	.00	.05	.00
10219770913	2804.02	<.1	.02	M 15	3.6	5.5	0.1	1.7	1.1	.02	1.0	.02	.03	.00
10219770920	242.28	1.2	.02	16	4.2	M 5.8	M .0	M 3.0	M 1.2	M .01	M .9	M .02	M .03	M .00
10219770927	0.00	M 3.1	M .02	M 18	M 4.5	M 6.1	M .0	M 4.3	M 1.3	M .01	M .8	M .02	M .03	M .00
10219771004	0.00	M 5.0	M .02	M 20	M 4.8	M 6.4	M .0	M 5.6	M 1.4	M .01	M .7	M .02	M .03	M .00
10219771011	0.00	M 6.9	M .02	M 23	M 5.1	M 6.8	M .0	M 7.0	M 1.6	M .01	M .6	M .02	M .03	M .00
10219771018	14.87	8.9	.04	26	5.5	M 7.1	M .0	M 8.4	M 1.8	M .01	M .5	M .02	M .03	M .00
10219771025	46.02	M 5.1	M .06	M 28	M18.4	M 7.5	M .0	M 9.8	M 2.0	M .01	M .5	M .03	M .03	M .00
10219771103	22182.90	1.4	.09	31	31.4	8.0	0.0	11.3	2.3	.02	0.6	.05	.05	.00
10219771108	13927.41	<.1	.02	28	8.4	M 6.2	M .0	M 7.6	M 1.6	M .01	M .5	M .03	M .03	M .00
10219771115	63439.68	<.1	.10	24	10.2	M 5.2	M .0	M 5.6	M 1.2	M .01	M .5	M .02	M .02	M .00
10219771122	15123.89	<.1	.78	16	10.2	M 3.8	M .0	M 2.8	M .6	M .01	M .5	M .01	M .01	M .00
10219771129	8890.94	<.1	.01	17	9.8	2.5	0.0	0.0	0.2	.01	0.5	.00	.01	.00
10219771206	7560.29	<.1	.02	13	8.9	8.3	0.4	3.3	1.7	.01	0.5	.02	.02	.00
10219771212	6505.80	<.1	.07	27	11.4	M 9.3	M .3	M 3.5	M 2.1	M .01	M .9	M .04		M .00
10219771220	10225.91	<.1	.03	32	8.9	M10.5	M .2	M 3.7	M 2.4	M .01	M 1.3	M .06		M .00
10219771230	36702.62	<.1	.02	27	11.8	M11.9	M .1	M 4.0	M 2.9	M .01	M 1.8	M .09		M .00
10219780108	41064.63	0.3	.03	36	31.9	13.8	0.0	4.6	3.6	.02	2.5	.13		.00

Appendix D (Cont'd)

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CONCENTRATION TABLE
 ST. DATE     FLOW VOLUME   NO3-N   T C   COND      PH    D.O   TURB  SAL    F.S    BOD  COL-F  COL-T    TKN
10219780110     23120.12  C .07  M  7  M 81     4.4  M 9.1     2  M 0      2  M 1.6  M   0  M 559   0.56
10219780117     40860.61    .02    10    73     4.0    9.4     2    0      5    2.0      0    970   0.39
10219780124    139171.00    .11  M  8  M 65     4.1  M10.9     2  M 0      1  M 2.4  M   0  M 518   0.70
10219780131    193837.06    .04     7    83     4.3   12.6     1    0      2    2.8      0     67   1.40
10219780207     81276.13  C .02  M  6  M 47     4.8  M13.3     5  M 0     22  M 2.3  M   0  M  37   0.50
10219780216     26610.41    .03     5    40     5.4   14.5     9    0     28    1.8      0      7   0.48
10219780224     35846.93    .02  M  5  M 42     5.0  M12.6     6  M 0     15  M 1.7  M   0  M  15   0.84
10219780228     18397.28    .02     5    45     5.0   11.0    16    0     49    1.7      0     24   0.59
10219780308     60778.41  C .05  M  4  M 49     4.3  M10.3     8  M 0     22  M 1.4  M   0  M  17   0.45
10219780314     58071.39    .15     4    60     4.3    9.6     2    0      2    0.9      0      3   0.50
10219780321     25903.06    .05  M  7  M 55     4.7  M 8.3     9  M 0     12  M 2.4  M   0  M   3   0.39
10219780329     46250.18    .02    12    50     4.2    6.9     2    0      2    4.3      0      3   0.84
10219780405     35564.93    .05  M 14  M 57     4.7  M 7.6     5  M 0     18  M 4.0  M   0  M  56   0.20
10219780412      9949.62  M .02  M 16  M 63   M 4.9  M 8.3   M 7  M 0   M 35  M 3.8  M   0  M 103  M .11
10219780419      5892.56    .00    18    70     5.2    9.0     9    0     52    3.7      1    150   0.03
10219780425      6461.67    .06  M 15  M 63     5.4  M 7.7    14  M 0    118  M 4.5  M   0  M  93   0.98
10219780427     11277.34    .15  M 13  M 57     4.3  M 6.7     6  M 0     11  M 5.3  M   0  M  45   0.06
10219780502     44524.98    .04    13    55     4.7    6.4     8    0     23    3.6      0     29   1.09
10219780510     64209.30    .05  M 13  M 45     4.2  M 5.3     4  M 0      8  M 4.3  M   0  M  42   0.48
10219780516     74793.06    .07    15    30     4.3    3.6     9    0     20    2.3      1     64   0.45
10219780522     27805.38    .08  M 18  M 60     4.8  M 1.8    24  M 0    106  M 2.4  M   1  M 172   0.50
10219780529      6455.47    .02    21    90     4.7    0.0    15    0    165    2.6      1    280   1.46
10219780606     48176.43    .10  M 19  M 71     4.2  M 2.0     7  M 0    110  M 2.3  M   1  M 252   1.12
10219780614    142453.63    .10    18    50     4.2    4.4     7    0     19    2.0      1    220   0.78
10219780620     29702.08    .01  M 20  M 61     4.7  M 2.8    16  M 0     83  M 3.9  M  52  M 837   0.98
10219780628      8980.75    .05    22    70     5.5    1.6    24    0    128    5.5     92   1300   1.20
10219780705      2146.31    .08  M 21  M 54     4.8  M 2.7    34  M 0    150  M 4.1  M  69  M1779   2.02
10219780712      3992.85  M .05    21    40     4.8    3.8    26    0    116    2.9     49   2200  M1.76
10219780718      7109.25  M .02  M 24  M 67     5.2  M 2.9    36  M 0     63  M 2.6  M  22  M2576  M1.50
10219780725      6751.43    .01    27    92     5.7    2.2    43    0     79    2.4      0   2900   1.29
10219780801      3305.34    .01  M 27  M 83     5.8  M 2.0    59  M 0     84  M 2.7  M   0  M1555   2.41
10219780808     30482.10    .05    27    75     5.1    2.0    23    0     30    3.1      0    210   0.90
10219780814     16479.63    .04  M 27  M 75     4.1  M 2.6     5  M 0      7  M 4.6  M  13  M1227   0.76
10219780823     44032.84    .00    28    75     5.5    3.3    25    0     40    5.9     25   2100   0.98
10219780829      3884.42    .02  M 25  M 77     5.5  M 4.2    35  M 0     58  M 6.8  M 345  M1122   1.40
10219780905      2976.64    .01    23    80     5.8    4.9    50    0     36    7.5    560    470   1.96
10219780912       103.92    .04  M 21  M 79     5.6  M 5.1    42  M 0   M 34  M 7.0  M 520  M 607   1.88
10219780919         0.00  M .03  M 20  M 78   M 5.6  M 5.3  M 40  M 0   M 32  M 6.5  M 480  M 744  M1.90
10219780926         0.00  M .02  M 19  M 77   M 5.6  M 5.6  M 38  M 0   M 30  M 6.0  M 440  M 881  M1.92
10219781003         0.00  M .01  M 18  M 76   M 5.6  M 5.9  M 36  M 0   M 28  M 5.6  M 400  M1019  M1.94
10219781010         0.00  M .00  M 17  M 75   M 5.6  M 6.2  M 34  M 0   M 26  M 5.2  M 360  M1157  M1.97
10219781017         0.00  M .00  M 16  M 74   M 5.6  M 6.5  M 32  M 0   M 24  M 4.8  M 320  M1295  M1.99
10219781025         0.00  M .00  M 15  M 73   M 5.6  M 6.8  M 30  M 0   M 22  M 4.4  M 280  M1433  M2.02
10219781031         0.00  M .00  M 13  M 72   M 5.6  M 7.1  M 27  M 0   M 20  M 3.9  M 234  M1590  M2.05
10219781109         0.00  M .00  M 12  M 71   M 5.6  M 7.3  M 25  M 0   M 19  M 3.5  M 199  M1708  M2.07
10219781114         0.00  M .00  M 10  M 70   M 5.6  M 7.7  M 22  M 0   M 17  M 3.0  M 148  M1883  M2.11
10219781121         0.00  M .00  M  9  M 70   M 5.6  M 7.9  M 20  M 0   M 16  M 2.7  M 119  M1984  M2.13
10219781128         0.00  M .00  M  8  M 70   M 5.6  M 8.2  M 18  M 0   M 15  M 2.3  M  79  M2122  M2.16
10219781205         0.00  M .00  M  8  M 70   M 5.6  M 8.5  M 17  M 0   M 15  M 1.9  M  40  M2261  M2.19
10219781213      3763.80    .00    08    70     5.8    9.0    16    0     15    1.7      1   2400   2.24
10219781219      1593.98    .03  M  6  M 52     5.3  M 8.9    12  M 0     10  M 1.9  M   5  M1131   3.70
10219781228      8838.16    .63    05    40     5.0    8.9     4    0      6    2.2      9    180    .90
10219790104     28128.81    .13  M  5  M 51     4.2  M 7.7     2  M 0      5  M 1.7  M  10  M 196    .81
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10219780110	23120.12	<.1	.03	28	11.3	M12.7	M .0	M 4.2	M 3.2	M .01	M 2.3	M .10		M .00
10219780117	40860.61	0.2	.04	17	7.7	M11.8	M .0	M 3.8	M 2.9	M .01	M 2.2	M .08		M .00
10219780124	139171.00	<.1	.02	24	6.1	M10.5	M .0	M 3.3	M 2.5	M .01	M 2.0	M .05		M .00
10219780131	193837.06	<.1	.08	33	9.6	M 9.3	M .0	M 2.9	M 2.1	M .01	M 1.9	M .03		M .00
10219780207	81276.13	<.1	.02	20	8.6	8.1	0.0	2.5	1.8	.01	1.8	.02	.16	.00
10219780216	26610.41	<.1	.02	17	6.6	M 7.5	M .5	M 2.4	M 1.7	M .01	M 1.7	M .01	M .12	M .00
10219780224	35846.93	<.1	.01	12	10.8	M 6.8	M 1.2	M 2.3	M 1.6	M .01	M 1.6	M .01	M .08	M .00
10219780228	18397.28	<.1	.02	13	12.4	M 6.1	M 1.8	M 2.2	M 1.6	M .02	M 1.5	M .01	M .04	M .00
10219780308	60778.41	<.1	.04	15	8.6	5.9	2.2	2.2	1.7	.03	1.6	.02	.03	.00
10219780314	58071.39	<.1	.01	20	7.1	M 6.0	M 1.5	M 2.0	M 1.6	M .02	M 1.4	M .01	M .03	M .00
10219780321	25903.06	<.1	.00	18	6.2	M 6.1	M 1.0	M 1.9	M 1.5	M .01	M 1.3	M .01	M .03	M .00
10219780329	46250.18	<.1	.02	24	6.2	M 6.2	M .5	M 1.8	M 1.5	M .00	M 1.2	M .01	M .03	M .00
10219780405	35564.93	<.1	.00	23	6.2	6.5	0.0	1.8	1.6	.00	1.1	.02	.04	.00
10219780412	9949.62	M .0	M .00	M 20	M 6.3	M 6.7	M .0	M 1.8	M 1.5	M .00	M 2.6	M .01	M .03	M .00
10219780419	5892.56	<.1	.01	18	6.5	M 6.9	M .0	M 1.8	M 1.5	M .00	M 4.1	M .01	M .02	M .00
10219780425	6461.67	<.1	.03	36	9.0	M 7.1	M .0	M 1.8	M 1.5	M .00	M 5.6	M .01	M .01	M .00
10219780427	11277.34	<.1	.02	28	6.4	M 7.4	M .0	M 1.8	M 1.5	M .01	M 6.9	M .01	M .01	M .00
10219780502	44524.98	<.1	.02	25	6.7	7.5	0.0	1.8	1.6	.02	M 7.3	.01	.01	.00
10219780510	64209.30	<.1	.03	22	6.7	M 7.9	M .0	M 1.8	M 1.5	M .01	M 8.4	M .01	M .01	M .00
10219780516	74793.06	<.1	.03	16	7.1	M 7.0	M .0	M 1.8	M 1.5	M .01	M10.2	M .01	M .01	M .00
10219780522	27805.38	<.1	.02	27	6.1	M 6.8	M .0	M 1.8	M 1.5	M .01	M11.5	M .01	M .01	M .00
10219780529	6455.47	<.1	.03	35	7.2	M 6.6	M .0	M 1.8	M 1.5	M .01	M12.8	M .01	M .01	M .00
10219780606	48176.43	0.1	.03	64	5.5	6.5	0.0	2.0	1.6	.01	14.5	.02	.03	.00
10219780614	142453.63	<.1	.01	32	4.6	M 6.9	M .0	M 2.1	M 1.7	M .01	M19.3	M .02	M .03	M .00
10219780620	29702.08	<.1	.05	38	5.9	M 7.3	M .0	M 2.2	M 1.8	M .01	M24.1	M .02	M .03	M .00
10219780628	8980.75	<.1	.19	59	6.9	M 7.6	M .0	M 2.3	M 1.8	M .01	M27.7	M .02	M .03	M .00
10219780705	2146.31	<.1	.06	75	10.1	8.1	0.0	2.6	2.0	.03	32.7	.03	.04	.00
10219780712	3992.85	M .0	M .03	M 61	M 8.6	M 8.1	M .0	M 2.5	M 1.9	M .02	M32.1	M .02	M .04	M .00
10219780718	7109.25	M .0	M .05	M 47	M 7.2	M 8.1	M .0	M 2.5	M 1.8	M .01	M31.5	M .02	M .04	M .00
10219780725	6751.43	<.1	.05	35	6.0	M 8.1	M .0	M 2.5	M 1.8	M .01	M31.0	M .02	M .04	M .00
10219780801	3305.54	0.3	.07	52	8.7	8.2	0.0	2.5	1.8	.01	30.5	.03	.05	.00
10219780808	30482.10	<.1	.06	72	5.4	M 6.7	M .5	M 2.5	M 1.8	M .00	M26.7	M .02	M .04	M .00
10219780814	16479.63	<.1	.03	32	5.5	M 5.3	M 1.1	M 2.5	M 1.8	M .00	M22.9	M .01	M .03	M .00
10219780823	44032.84	<.1	.04	29	5.9	M 4.0	M 1.6	M 2.5	M 1.8	M .00	M19.7	M .01	M .02	M .00
10219780829	3884.42	<.1	.05	44	8.8	M 2.2	M 2.4	M 2.5	M 1.9	M .00	M15.0	M .01	M .01	M .00
10219780905	2976.64	<.1	.08		8.2	1.1	3.0	2.6	2.0	.00	11.9	.02	.02	.00
10219780912	185.92	<.1	.08		8.8	M 1.4	M 2.9	M 2.6	M 1.9	M .00	M11.3	M .02	M .02	M .00
10219780919	0.00	M 2.1	M .37		M 8.5	M 1.7	M 2.8	M 2.6	M 1.8	M .00	M10.7	M .02	M .02	M .00
10219780926	0.00	M 4.1	M .66		M 8.3	M 2.0	M 2.7	M 2.6	M 1.8	M .00	M10.1	M .02	M .02	M .00
10219781003	0.00	M 6.1	M .95		M 8.1	M 2.3	M 2.6	M 2.6	M 1.8	M .00	M 9.5	M .02	M .02	M .00
10219781010	0.00	M 8.1	M1.24		M 7.9	M 2.6	M 2.5	M 2.6	M 1.8	M .00	M 8.9	M .02	M .02	M .00
10219781017	0.00	M10.1	M1.53		M 7.7	M 2.9	M 2.4	M 2.6	M 1.8	M .00	M 8.3	M .02	M .02	M .00
10219781025	0.00	M12.1	M1.82		M 7.5	M 3.3	M 2.4	M 2.6	M 1.8	M .00	M 7.7	M .02	M .02	M .00
10219781031	0.00	M14.4	M2.16		M 7.2	M 3.7	M 2.4	M 2.6	M 1.8	M .00	M 7.0	M .02	M .02	M .00
10219781109	0.00	M16.1	M2.41		M 7.0	M 4.0	M 2.4	M 2.6	M 1.8	M .00	M 6.4	M .02	M .02	M .00
10219781114	0.00	M18.8	M2.79		M 6.7	M 4.5	M 2.4	M 2.6	M 1.8	M .00	M 5.6	M .02	M .02	M .00
10219781121	0.00	M20.3	M3.00		M 6.6	M 4.8	M 2.4	M 2.6	M 1.8	M .00	M 5.1	M .02	M .02	M .00
10219781128	0.00	M22.4	M3.30		M 6.4	M 5.2	M 2.4	M 2.6	M 1.8	M .00	M 4.5	M .02	M .02	M .00
10219781205	0.00	M24.5	M3.60		M 6.3	M 5.6	M 2.4	M 2.6	M 1.8	M .00	M 3.9	M .02	M .02	M .00
10219781213	3763.88	26.7	3.91		6.2	M 6.0	M 2.4	M 2.6	M 1.8	M .00	M 3.3	M .02	M .02	M .00
10219781219	1593.98	3.4	.54		4.7	M 6.5	M 2.4	M 2.7	M 1.8	M .00	M 2.7	M .02	M .02	M .00
10219781228	8838.16	.2	.25		4.5	M 6.9	M 2.4	M 2.8	M 1.8	M .00	M 2.2	M .02	M .02	M .00
10219790104	28128.81	<.1	.08		5.0	7.5	2.4	3.0	1.8	.01	1.6	.03	.03	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10219790109	60419.00	.06	06	60	4.2	6.8	1	M 0	11	1.4	12	210	.48
10219790116	84586.50	.11	M 6	M 60	4.0	M 7.3	1	M 0	2	M 1.4	M 7	M 142	.67
10219790123	84586.50	.00	08	60	4.3	8.0	2	M 0	2	1.6	0	47	.84
10219790130	48056.56	.00	M 5	M 55	4.4	M10.3	2	M 0	11	M 1.0	M 0	M 34	.42
10219790206	20379.38	.00	03	50	5.1	12.6	28	M 0	15	.5	0	21	.92
10219790213	23755.19	.06	M 4	M 53	4.7	M11.6	2	M 0	24	M 1.5	M 0	M 20	.56
10219790222	36135.28	.03	M 5	M 56	4.0	M10.6	1	M 0	10	M 2.6	M 0	M 19	.67
10219790227	33815.12	.02	08	60	4.0	9.4	1	M 0	6	M 4.0	0	19	.62
10219790307	45479.22	.00	M 10	M 60	4.0	M 9.5	1	M 0	11	M 4.8	M 0	M 17	.53
10219790313	34109.41	.00	14	60	4.4	9.9	2	0	26	6.1	0	16	.67
10219790320	23603.57	.00	M 12	M 60	5.0	M 8.8	2	M 0	22	M 4.2	M 0	M 13	.42
10219790327	27234.95	.00	10	60	4.6	7.6	13	0	8	2.0	0	11	.92
10219790405	27285.05	.07	M 13	M 66	4.7	M 7.1	2	M 0	6	M 2.1	M 0	M 6	.48
10219790411	14421.97	.00	17	75	5.5	6.5	2	0	14	2.4	0	00	.45
10219790417	39379.87	.04	M 17	M 62	4.6	M 5.5	1	M 0	4	M 3.0	M 0	M 8	.36
10219790424	16447.72	.00	17	50	5.7	4.7	2	0	12	3.8	0	16	.50
10219790501	22696.86	.02	M 17	M 60	5.3	M 4.0	2	M 0	14	M 2.7	M 0	M 36	.34
10219790508	11778.06	.03	18	70	5.9	3.5	23	M 0	12	1.7	0	57	3.08
10219790516	27225.14	.11	M 17	M 65	4.3	M 4.5	1	M 0	10	M 1.3	M 0	M 59	.84
10219790522	63986.48	.00	17	60	4.4	5.7	2	0	18	1.4	0	63	1.40
10219790529	45132.80	.02	M 18	M 57	4.9	M 5.1	2	M 0	24	M 1.6	M 0	M 64	.53
10219790606	35717.10	.01	21	50	5.0	4.6	2	0	4	2.0	0	67	.40
10219790612	15002.60	C .02	M 20	M 60	5.9	M 3.0	3	M 0	M 33	M 3.7	M 525	M 051	1.49
10219790619	3607.18	.02	20	65	5.5	1.9	6	0	56	5.0	M 919	M1439	5.57
10219790626	1207.40	.05	M 20	M 62	5.7	M 2.6	4	M 0	68	M 4.2	M1379	M2125	1.69
10219790703	1035.01	M .09	M 21	M 59	M 5.5	M 3.3	M 4	M 0	M 55	M 3.4	M1839	M2812	M1.85
10219790710	330.21	.14	M 21	M 56	5.4	M 4.1	M 4	M 0	M 42	M 2.7	2300	3500	2.03
10219790717	0.00	M .09	M 22	M 53	M 5.3	M 4.9	M 5	M 0	M 29	M 2.0	M6149	M1810	M1.34
10219790723	4551.31	.06	24	50	5.3	5.8	6	0	17	1.4	9999	120	.66

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MC	CU	FE	MN	ZN	CD
10219790109	60419.00	<.1	.01		8.0	M 7.0	M 2.1	M 4.2	M 1.9	M .01	M 1.4	M .02	M .02	M .00
10219790116	84586.50	<.1	.00		6.5	M 6.6	M 1.9	M 5.0	M 2.0	M .01	M 1.3	M .02	M .01	M .00
10219790123	84586.50	<.1	.03		7.4	M 6.1	M 1.6	M 6.2	M 2.1	M .01	M 1.2	M .02	M .01	M .00
10219790130	48056.56	<.1	.03		8.4	M 5.7	M 1.4	M 7.4	M 2.3	M .01	M 1.1	M .02	M .01	M .00
10219790206	20379.38	<.1	.04		9.1	5.4	1.2	8.8	2.5	.02	1.1	.03	.02	.00
10219790213	23755.19	<.1	.01		9.7	M 5.4	M 1.0	M 7.1	M 2.1	M .01	M 1.0	M .03	M .01	M .00
10219790222	36135.28	<.1	.01		8.8	M 5.4	M .8	M 5.4	M 1.8	M .00	M .9	M .04	M .00	M .00
10219790227	33815.12	<.1	.01		8.6	M 5.4	M .6	M 3.3	M 1.4	M .00	M .8	M .05	M .00	M .00
10219790307	45479.22	<.1	.00		7.9	5.5	0.5	2.2	1.3	.00	0.8	.07	.00	.00
10219790313	34109.41	<.1	.01		8.7	M 5.6	M .3	M 2.0	M 1.3	M .00	M 1.0	M .05	M .00	M .00
10219790320	23603.57	<.1	.00		8.4	M 5.7	M .2	M 1.9	M 1.3	M .00	M 1.1	M .03	M .00	M .00
10219790327	27234.95	<.1	.01		8.2	M 5.8	M .1	M 1.8	M 1.3	M .01	M 1.3	M .01	M .00	M .00
10219790405	27285.05	<.1	.00		8.0	6.0	0.0	1.8	1.4	.02	1.6	.00	.00	.00
10219790411	14421.97	<.1	.02		7.3	M 6.4	M .1	M 1.9	M 1.3	M .02	M 1.5	M .00	M .00	M .00
10219790417	39379.87	<.1	.01		6.8	M 6.7	M .2	M 1.9	M 1.2	M .02	M 1.5	M .00	M .00	M .00
10219790424	16447.72	<.1	.01		6.9	M 7.0	M .3	M 2.0	M 1.1	M .02	M 1.5	M .00	M .00	M .00
10219790501	22696.86	<.1	.01		6.4	7.3	0.6	2.2	1.2	.03	1.5	.02	.00	.00
10219790508	11778.06	<.1	.03		7.7	M 7.3	M .5	M 2.1	M 1.1	M .02	M 1.7	M .02	M .00	M .00
10219790516	27225.14	<.1	.02		5.5	M 7.1	M .5	M 2.0	M 1.0	M .01	M 1.9	M .02	M .00	M .00
10219790522	63986.48	<.1	.01		5.0	M 6.9	M .5	M 1.9	M .9	M .01	M 2.2	M .02	M .00	M .00
10219790529	45132.80	<.1	.01		5.1	M 6.8	M .5	M 1.8	M .9	M .01	M 2.4	M .02	M .00	M .00
10219790606	35717.10	<.1	.01		5.7	M 6.6	M .5	M 1.7	M .9	M .01	M 2.6	M .02	M .00	M .00
10219790612	15002.60	.3	.04		7.7	M 6.4	M .5	M 1.6	M .9	M .01	M 2.9	M .02	M .00	M .00
10219790619	3607.18	<.1	.02		8.1	M 6.3	M .5	M 1.5	M .9	M .01	M 3.1	M .02	M .00	M .00
10219790626	1207.40	.2	.06		14.7	M 6.2	M .5	M 1.4	M .9	M .01	M 3.4	M .02	M .00	M .00
10219790703	1035.01	M .1	M .07		M11.3	M 6.1	M .5	M 1.4	M .9	M .01	M 3.7	M .02	M .00	M .00
10219790710	330.21	.2	.09		8.0	M 6.0	M .5	M 1.4	M .9	M .01	M 4.0	M .02	M .00	M .00
10219790717	0.00	M .1	M .05		M 4.2	M 5.9	M .5	M 1.4	M .9	M .01	M 4.3	M .02	M .00	M .00
10219790723	4551.31	<.1	.01		.5	M 5.8	M .5	M 1.4	M .9	M .01	M 4.6	M .02	M .01	M .00

Appendix D (Cont'd)

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CONCENTRATION TABLE
  ST. DATE    FLOW VOLUME    NO3-N     T C    COND      PH     D.O    TURB     SAL     F.S    BOD  COL-F  COL-T    TKN
 10319760714     94602.44      .19      25     115     3.6     4.2     <25       0      14    5.1    230   1000   1.83
 10319760721    299893.94   M .26  M   25  M  137   M 5.0   M 2.9  M   25  M    0  M   11  M 6.6  M 400  M2950  M1.54
 10319760727    124216.56      .34      25     160     6.5     1.7     <25       0       8    8.3    570   4900   1.26
 10319760803    144919.31      .47      22     150     6.3   M 1.3     <25       0      16  M 6.5  M 560  M4946   1.18
 10319760810    144919.31   C  .11      23      85     6.6     1.0  M   25       0      10    4.5    850   5000   1.96
 10319760817    107873.75   C  .00  M   26  M  127     7.2   M  .6  M   25  M    0      27  M 5.0  M 775  M5300   1.85
 10319760824     52834.44      .01      27     170     6.9     0.3  M   25       0      36    5.5   1000   5600   1.71
 10319760831     56245.35      .00      23     175     7.1   M  .3  M   25       0      38  M 5.4  M 810  M5809   2.27
 10319760907     33651.00      .15      22     120     7.4     0.4  M   25       0      27  M 5.3  M 636  M6019   2.49
 10319760916     44181.55      .15      22     130     6.8   M  .5     <25       0  M   17  M 5.3  M 454  M6229   1.40
 10319760922     70674.19      .08      21     160     6.7     0.8     <25       0       6    5.3    220   6500   1.74
 10319760928     34654.50      .25      23     170     6.9   M 1.5     <25       0      10  M 4.8  M 180  M4750   1.48
 10319761005     42163.00      .02      19     170     7.0     2.3  M   25       0       7    4.4    140   3000   1.74
 10319761012         0.00      .69  M   16  M  157     7.2   M 1.8  M   25  M    0       8  M 4.4  M 203  M2433   1.65
 10319761019     24990.54      .11      13     145     6.2   M 1.3     <25       0      12  M 4.4  M 266  M1866   1.40
 10319761026    120833.13      .07      22     140     6.1     0.9     <25       0       7    4.4    330   1300   1.12
 10319761102     71817.00      .46       8     120     7.1   M 2.4     <25       3      39  M 3.0  M 109  M 765   1.32
 10319761109     32568.52      .57       7     120     6.6     4.1      27       0       6    1.6     49    230   1.29
 10319761115     26712.96     1.06       6     115     6.6   M 3.9      30       1      14  M 2.4  M 119  M 396   1.76
 10319761122    136796.00     2.12       8     115     6.1   M 3.8     <25       0      12    3.2    180    540   1.52
 10319761130    140970.19     1.99  M   10  M   94     6.0   M 3.7      25  M    0      10  M 2.9  M1355  M 723   1.54
 10319761207    127139.06      .93      13      70     6.4     3.7     <25       0      10    2.6   2700  M 932   1.32
 10319761214    361724.69     1.20       8      80     5.3   M 3.8     <25       0       2  M 2.4  M1605  M1116   1.51
 10319761220    818964.13      .28      11      90     5.3     3.9     <25       0  M    3    2.3    510   1300   1.99
 10319761229    436843.38   C  .15  M    8  M   70     5.0   M 4.2     <25  M    0       4  M 1.7  M 306  M 784   1.37
 10319770113    179989.94      .10       4      40     5.1     4.7     <25       0       1    1.0      0     11   2.63
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CONCENTRATION TABLE
  ST. DATE    FLOW VOLUME    NH4-N      P     TOC      CL      NA       K      CA      MG      CU      FE      MN      ZN      CD
 10319760714     94602.44      <.1   3.20      54     9.0   M 4.3   M 2.9   M18.5   M 3.1   M .00   M  .8   M .00   M .00   M .00
 10319760721    299893.94   M   .0  M2.62  M   50   M 8.0   M 5.0   M 2.4   M20.7   M 3.4   M .00   M  .8   M .00   M .00   M .00
 10319760727    124216.56      <.1   2.05      46     7.2   M 5.5   M 1.9   M23.0   M 3.7   M .00   M  .8   M .00   M .00   M .00
 10319760803    144919.31      <.1   1.78      58     6.8     6.0     1.5    25.0     4.0     .00     0.9     .00     .00     .00
 10319760810    144919.31      <.1   4.48      67    10.0   M 5.8   M 1.5   M25.3   M 4.1   M .00   M  .8   M .00   M .00   M .00
 10319760817    107873.75       .1   1.11      53     7.2   M 5.6   M 1.5   M25.6   M 4.3   M .00   M  .8   M .00   M .00   M .00
 10319760824     52834.44       .5    .58      49     7.3   M 5.4   M 1.5   M26.0   M 4.4   M .00   M  .8   M .00   M .00   M .00
 10319760831     56245.35       .4    .34      42     6.3   M 5.2   M 1.5   M26.4   M 4.6   M .00   M  .8   M .00   M .00   M .06
 10319760907     33631.00      <.1    .15      41     7.0   M 5.0   M 1.5   M26.8   M 4.8   M .00   M  .8   M .00   M .00   M .00
 10319760916     44181.55      <.1    .16      42     6.6     5.0     1.5    27.3     5.1     .00     0.8     .00     .00     .00
 10319760922     70674.19       .1    .89      40     8.4   M 5.0   M 1.5   M27.3   M 5.1   M .00   M 1.0   M .00   M .00   M .00
 10319760928     34654.50      <.1    .36     122     7.4   M 5.0   M 1.5   M27.4   M 3.1   M .00   M 1.1   M .00   M .00   M .00
 10319761005     42163.00       .6    .38      69     6.6     5.0     1.5    27.5     5.2     .00     1.3     .00     .00     .00
 10319761012         0.00      <.1    .27      49    14.2   M 5.0   M 1.6   M27.9   M 5.0   M .00   M 1.4   M .00   M .00   M .00
 10319761019     24990.54      <.1    .25      45     6.6   M 5.0   M 1.7   M28.3   M 4.9   M .00   M 1.5   M .00   M .00   M .00
 10319761026    120833.13      <.1    .49      47    10.2   M 5.0   M 1.8   M28.8   M 4.8   M .00   M 1.6   M .00   M .00   M .00
 10319761102     71817.00      <.1    .52      44     8.2     5.0     2.0    29.3     4.8     .00     1.8     .00     .00     .00
 10319761109     32568.52       .2    .43      34     7.7   M 4.9   M 2.0   M27.9   M 4.6   M .00   M 1.8   M .00   M .00   M .00
 10319761115     26712.96      <.1    .64      36     6.6   M 4.8   M 2.0   M26.5   M 4.4   M .00   M 1.9   M .00   M .00   M .00
 10319761122    136796.00      <.1   1.18      31    10.8   M 4.7   M 2.0   M25.3   M 4.2   M .00   M 2.0   M .00   M .00   M .00
 10319761130    140970.19      <.1   1.14      42     8.8   M 4.6   M 2.0   M23.9   M 4.1   M .00   M 2.1   M .00   M .00   M .00
 10319761207    127139.06      <.1   1.42      49    10.4     4.5     2.0    22.5     4.0     .00     2.3     .00     .00     .00
 10319761214    361724.69      <.1   1.93      59    10.3   M 4.3   M 2.0   M20.4   M 3.8   M .00   M 1.9   M .00   M .00   M .00
 10319761220    818964.13       .6   3.23      44    12.1   M 4.2   M 2.0   M18.4   M 3.7   M .00   M 1.6   M .00   M .00   M .00
 10319761229    436843.38       .9   3.14      50    11.8   M 4.1   M 2.0   M16.7   M 3.6   M .00   M 1.3   M .00   M .00   M .00
 10319770113    179989.94       .8   3.29      51    11.4     4.0     2.0    14.2     3.5     .00     1.0     .02     .00     .00
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10319770119	616701.06	.24	3	90	5.4	3.0	<25	0	7	M 1.6	M 11	M 195	1.82
10319770120	255689.44	C .03	5	80	6.3	2.7	<25	0	12	M 1.8	M 15	M 260	1.34
10319770131	60499.34	C .01	0	80	6.4	2.1	<25	0	17	2.3	23	380	0.92
10319770207	113436.88	.00	5	115	5.9	3.2	26	0	M 12	M 2.5	8	250	1.90
10319770216	115539.69	.00	5	M 121	6.1	3.1	<25	M 0	3	3.1	250	500	0.76
10319770224	78023.19	.02	-2	130	6.0	3.3	<25	2	10	M 3.6	M 210	M 473	1.80
10319770302	110339.13	.03	10	115	5.9	4.0	<25	6	16	4.1	190	450	2.04
10319770310	292775.50	.27	M 11	M 112	5.2	M 3.4	<25	M 0	8	M 4.1	M 215	M 617	.40
10319770318	423187.56	.06	13	110	5.6	2.8	<25	0	6	4.2	250	840	.18
10319770323	229469.13	.01	M 14	M 122	5.3	M 2.6	67	M 0	91	M 5.4	M 166	M 570	6.90
10319770401	234553.60	.00	16	130	5.8	2.6	30	0	16	M 6.2	M 114	M 402	1.13
10319770406	56381.54	.09	15	130	6.0	2.6	<25	0	19	7.7	21	100	1.12
10319770413	53122.05	.14	M 19	M 154	6.3	M 4.3	27	M 0	17	M 7.6	M 12	M 120	2.24
10319770420	41409.38	.29	25	190	6.6	6.8	<33	0	7	7.6	1	150	3.14
10319770427	39225.61	.13	M 24	M 150	6.2	M 6.1	<25	M 0	8	M 7.5	M 485	M 625	1.76
10319770504	32394.15	.32	24	110	5.9	5.5	41	0	21	7.6	970	1190	8.13
10319770511	333733.94	.62	M 24	M 142	5.7	M 3.3	10	M 0	7	M 5.8	M 820	M2137	1.02
10319770519	75472.69	.32	24	175	6.0	1.6	<25	0	4	4.1	670	M3175	2.09
10319770526	702878.56	.68	M 29	M 159	6.9	M 2.1	<25	M 0	23	M 3.5	M 899	M4361	2.32
10319770601	1951027.00	.25	35	145	5.7	2.6	<25	M 0	10	3.0	1100	5400	2.24
10319770608	698099.75	.33	M 30	M 145	5.8	M 2.8	<25	M 0	10	M 4.2	M 629	M5030	1.61
10319770614	91049.25	.16	25	145	6.0	3.1	13	0	15	5.7	80	4600	1.48
10319770621	51137.89	.00	M 25	M 154	6.0	M 2.6	10	M 0	76	M 5.6	M 370	M3215	3.08
10319770629	53500.93	1.44	M 25	M 163	6.1	M 2.1	8	M 0	12	5.5	710	1600	2.52
10319770706	38951.67	.02	M 23	M 178	5.8	M 1.6	8	M 0	52	M 5.3	M 592	M2026	1.68
10319770713	28794.79	.00	25	190	6.3	1.2	6	0	4	5.2	M 409	2406	1.54
10319770721	20349.55	.00	M 23	M 180	6.0	M 1.5	1	M 0	16	M 5.8	M 386	M2353	4.76
10319770726	9902.83	.04	26	170	5.7	1.9	9	0	23	6.5	270	2300	15.1
10319770802	17710.34	.37	M 26	M 157	4.7	M 1.7	5	M 0	21	M 8.1	M4323	M5507	8.22
10319770810	14241.70	.86	31	140	5.1	M 1.5	3900	0	6960	M10.3	9999	9999	1.90
10319770817	12154.39	.03	28	80	5.6	M 1.3	2000	0	1489	13.0	9999	9999	12.6
10319770822	14738.25	.44	24	140	4.7	1.3	20	0	36	7.0	330	9999	3.78
10319770830	23581.19	.02	M 24	M 130	5.5	M 1.8	26	M 0	28	M 6.8	M 541	M9999	2.38
10319770906	17997.57	.03	26	115	5.5	2.6	6	0	22	6.5	880	9999	1.96
10319770913	394634.44	.06	23	120	4.9	1.4	1	0	11	4.6	1000	3700	1.68
10319770920	135578.38	.06	24	135	5.5	0 6	9	0	12	8.5	799	5200	2.24
10319770927	62138.62	.00	M 20	M 120	5.7	M 1.1	8	M 0	13	M 6.3	M5394	M7599	2.38
10319771004	43183.38	.00	17	103	6.0	1.8	5	0	11	4.1	9999	9999	1.12
10319771011	36070.87	.00	M 15	M 105	6.8	M 2.3	7	M 0	12	M 2.4	M5043	M5164	1.68
10319771018	391402.19	.10	13	105	4.8	2.8	57	0	7	.8	87	330	1.51
10319771025	156974.06	.10	M 17	M 122	5.8	M 2.5	100	M 0	6	M 2.1	M 128	M 310	1.38
10319771103	2332329.00	.20	22	140	3.9	2.3	3	0	4	3.6	170	290	1.32
10319771108	1673112.00	.13	M 14	M 104	3.7	M 3.7	3	M 0	2	M 4.4	M 836	M 662	1.86
10319771115	2652336.00	.14	11	85	4.8	4.6	<25	0	54	5.0	1300	870	3.38
10319771122	183141.13	.11	M 11	M 77	5.6	M 3.8	16	M 0	49	M 4.8	M1230	M1535	1.62
10319771129	273963.13	.11	11	70	5.4	3.0	90	0	5	4.6	1200	2200	1.40
10319771206	169923.50	.00	M 8	M 67	5.6	M 2.7	29	M 0	31	M 4.8	M 860	M1650	1.37
10319771212	163386.56	.10	5	65	5.5	2.5	13	0	9	3.5	520	1100	2.69
10319771220	531473.25	.15	M 5	M 67	3.9	M 3.3	5	M 0	5	M 3.0	M 552	M 912	1.29
10319771230	711013.88	C .15	M 6	M 70	5.0	M 4.4	4	M 0	1	M 2.4	M 593	M 662	1.12
10319780105	580306 50	.03	8	75	4.5	5.9	4	0	5	1.8	630	350	2.52

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10319770119	616701.06	.7	2.88	41	14.2	M 4.6	M 2.9	M18.1	M 3.6	M .00	M 2.5	M .03	M .04	M .00
10319770120	255689.44	.7	1.87	38	9.6	M 4.8	M 3.2	M19.6	M 3.6	M .00	M 3.1	M .03	M .05	M .00
10319770131	60499.34	.8	1.84	39	9.8	M 5.3	M 3.8	M21.9	M 3.8	M .00	M 4.1	M .05	M .08	M .00
10319770207	113436.88	1.0	1.44	47	10.7	5.5	4.0	22.8	3.9	.00	4.5	.06	.10	.00
10319770216	115539.69	.7	.92	42	8.8	M 5.6	M 3.4	M21.4	M 3.6	M .01	M 4.0		M .07	M .00
10319770224	78023.19	.8	.69	39	8.1	M 5.8	M 2.7	M19.7	M 3.3	M .02	M 3.4		M .04	M .00
10319770302	110339.13	.4	1.09	36	29.7	6.0	2.2	18.3	3.1	.04	2.9		.03	.00
10319770310	292775.50	.2	2.80	48	10.6	M 5.4	M 2.1	M17.9	M 3.0	M .03	M 2.7		M .02	M .00
10319770318	423187.56	<.1	3.10	60	10.6	M 4.6	M 2.0	M17.4	M 3.0	M .01	M 2.4		M .01	M .00
10319770323	229469.13	<.1	2.54	41	10.7	M 3.9	M 2.0	M16.9	M 3.0	M .00	M 2.2		M .01	M .00
10319770401	234553.50	<.1	2.48	35	10.6	3.5	2.0	16.7	3.0	.00	2.1	.04	.02	.00
10319770406	56381.54	<.1	1.73	39	8.6	M 4.2	M 1.4	M16.8	M 3.0	M .00	M 2.3	M .04	M .01	M .00
10319770413	55122.05	<.1	1.12	79	8.7	M 4.6	M 1.1	M16.8	M 3.0	M .00	M 2.4	M .04	M .01	M .00
10319770420	41409.58	<.1	.85	83	8.3	M 5.2	M .7	M16.9	M 3.0	M .00	M 2.6	M .04	M .01	M .00
10319770427	39225.61	.2	.67	75	7.4	M 5.8	M .3	M17.0	M 3.1	M .00	M 2.8	M .04	M .01	M .00
10319770504	32394.15	<.1	.50	63	8.2	6.5	0.0	17.3	3.3	.00	3.1	.04	.02	.00
10319770511	333733.94	.1	1.45	63	8.4	M 6.1	M .6	M16.0	M 3.2	M .00	M 2.8	M .05	M .02	M .00
10319770519	75472.69	<.1	1.70	56	9.7	M 5.8	M 1.2	M14.7	M 3.1	M .00	M 2.5	M .06	M .02	M .00
10319770526	702878.56	.2	1.72	59	6.6	M 5.4	M 1.9	M13.2	M 3.0	M .00	M 2.2	M .08	M .03	M .00
10319770601	1951027.00	.6	2.09	72	11.3	5.2	2.6	12.0	3.1	.01	2.0	.10	.04	.00
10319770608	698099.75	.2	2.18	70	10.0	M 5.3	M 2.7	M13.8	M 3.2	M .00	M 2.1	M .09	M .03	M .00
10319770614	91049.25	<.1	1.11	68	9.2	M 5.4	M 2.8	M15.9	M 3.4	M .00	M 2.2	M .07	M .02	M .00
10319770621	51137.89	.9	.68	83	7.8	M 5.5	M 2.9	M17.7	M 3.5	M .00	M 2.3	M .06	M .02	M .00
10319770629	53500.93	.1	.86	74	8.3	M 5.7	M 3.1	M19.8	M 3.7	M .00	M 2.5	M .05	M .02	M .00
10319770706	38931.67	.4	.37	59	7.1	6.1	3.4	22.4	4.1	.00	2.8	.05	.03	.00
10319770713	28794.79	<.1	.26	59	7.2	M 5.9	M 3.2	M22.8	M 4.2	M .00	M 3.1	M .05	M .03	M .00
10319770721	20349.55	.2	.21	65	8.6	M 5.7	M 3.0	M23.2	M 4.4	M .00	M 3.4	M .05	M .03	M .00
10319770726	9902.83	.1	.20	72	7.4	M 5.5	M 2.8	M23.6	M 4.6	M .01	M 3.7	M .06	M .04	M .00
10319770802	17710.34	.1	.22	72	7.3	5.4	2.7	24.0	4.8	.02	4.0	.07	.05	.00
10319770810	14241.78	<.1	.20	68	7.6	M 5.2	M 2.8	M22.6	M 4.5	M .01	M 3.5	M .05	M .04	M .00
10319770817	12154.39	.7	.78	172	9.6	M 4.9	M 2.9	M21.1	M 4.2	M .00	M 2.9	M .03	M .03	M .00
10319770822	14730.25	.4	2.70	99	12.8	M 4.7	M 3.0	M19.8	M 3.9	M .00	M 2.4	M .01	M .02	M .00
10319770830	23581.19	<.1	2.04	52	11.5	M 4.6	M 3.1	M18.8	M 3.7	M .00	M 2.0	M .00	M .02	M .00
10319770906	17997.57	.1	1.34	44	10.3	4.5	3.3	17.4	3.5	.00	1.5	.00	.03	.00
10319770913	394634.44	.1	2.62	60	12.0	7.0	0.2	14.5	3.4	.02	1.4	.02	.02	.00
10319770920	135578.38	<.1	2.80	62	12.2	M 7.0	M .6	M15.3	M 3.4	M .01	M 1.5	M .01	M .02	M .00
10319770927	62138.62	.1	2.19	42	12.0	M 7.0	M 1.0	M16.2	M 3.4	M .00	M 1.6	M .00	M .02	M .00
10319771004	43183.38	<.1	1.10	52	10.2	7.0	1.5	17.2	3.6	.00	1.9	.00	.04	.00
10319771011	36070.87	<.1	.54	M 51	8.9	M 6.8	M 1.1	M15.2	M 3.3	M .00	M 1.8	M .01	M .04	M .00
10319771018	391402.19	<.1	2.40	51	11.4	M 6.6	M .7	M13.3	M 3.0	M .01	M 1.6	M .02	M .04	M .00
10319771025	156974.06	<.1	2.70	52	12.2	M 6.4	M .3	M11.4	M 2.7	M .01	M 1.5	M .03	M .04	M .00
10319771103	2332329.00	.3	3.30	49	10.4	6.3	0.0	9.8	2.5	.03	1.5	.05	.05	.00
10319771108	1673112.00	.3	3.16	49	10.3	M 5.3	M .0	M 7.2	M 2.0	M .02	M 1.4	M .04	M .03	M .00
10319771115	2652336.00	.6	7.08	59	12.0	M 4.7	M .0	M 5.9	M 1.7	M .01	M 1.3	M .03	M .02	M .00
10319771122	103141.13	.4	2.78	48	11.6	M 3.9	M .0	M 4.1	M 1.4	M .01	M 1.3	M .02	M .01	M .00
10319771129	273963.13	.4	2.40	59	10.7	3.2	0.0	2.4	1.1	.02	1.3	.02	.01	.00
10319771206	169923.50	.3	2.66	38	11.2	5.8	0.0	10.5	1.9	.00	1.6	.02	.02	.00
10319771212	163306.56	.8	4.06	83	10.0	M 5.9	M .0	M10.8	M 2.2	M .00	M 2.0	M .02	M .02	M .00
10319771220	831473.25	.6	1.46	42	7.0	M 6.0	M .0	M11.0	M 2.4	M .00	M 2.4	M .02	M .02	M .00
10319771230	711013.88	.4	2.56	59	10.2	M 6.2	M .0	M11.4	M 2.8	M .00	M 2.9	M .03	M .03	M .00
10319780105	580306.50	0.8	2.82	58	10.1	6.5	0.0	12.0	3.3	.02	3.6	.06	.06	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.B	BOD	COL-F	COL-T	TKN
10319780110	372341.50	G .00	M 8	M 75	4.0	M 5.7	6	M 0	9	M 1.6	M 546	M 813	1.60
10319780117	783405.13	G .14	8	75	4.1	5.6	4	0	4	1.5	460	1200	0.64
10319780124	2706238.00	M .27	M 6	M 67	M 4.0	M 3.3	M 4	M 0	M 6	M 1.4	M 455	M1700	M1.00
10319780131	526838.38	.40	4	60	4.5	1.0	4	0	8	1.4	450	2200	1.37
10319780207	205669.56	.33	M 4	M 60	5.5	M 2.0	6	M 0	14	M 1.5	M 460	M1950	1.68
10319780216	97400.00	.03	4	60	6.1	3.0	8	0	4	1.7	470	1700	1.26
10319780224	432566.31	.06	M 4	M 54	5.2	M 4.0	4	M 0	6	M 1.5	M 430	M1239	1.43
10319780228	254517.88	.10	5	50	5.2	5.0	14	0	43	1.5	410	830	1.34
10319780308	1425469.00	.19	M 7	M 53	4.8	M 5.2	7	M 0	8	M 1.4	M 323	M 790	0.95
10319780314	391770.25	.23	14	60	4.6	5.8	4	0	3	1.4	150	710	0.98
10319780321	178921.19	.06	M 14	M 73	5.6	M 5.9	13	M 0	8	M 1.7	M 159	M 534	1.74
10319780329	257028.44	.08	14	90	5.0	6.2	8	0	3	2.1	170	330	1.46
10319780405	132786.00	G .06	M 16	M 95	5.8	M 4.6	28	M 0	13	M 2.8	M 136	M 402	2.69
10319780412	55977.84	M .07	18	100	M 5.9	3.3	M 20	0	M 20	M 3.4	M 106	M 466	M2.14
10319780419	100619.00	G .10	16	95	6.0	4.6	12	0	28	4.2	77	830	1.60
10319780425	170797.25	.04	M 16	M 88	5.8	M 5.3	8	M 0	16	M 3.7	M 171	M 590	1.85
10319780427	973532.75	G .95	M 16	M 82	3.8	M 5.9	6	M 0	9	M 3.3	M 232	M 642	1.32
10319780502	1043096.63	.76	16	80	4.4	6.2	6	0	7	3.3	280	660	1.96
10319780510	1422941.00	.11	M 16	M 76	3.9	M 5.4	4	M 0	6	M 4.2	M 272	M1175	1.43
10319780516	691923.81	.03	18	78	4.2	4.2	5	0	3	5.7	260	2000	1.40
10319780522	231285.38	.12	M 23	M 84	4.8	M 3.9	13	M 0	11	M 4.1	M 146	M1550	2.10
10319780529	89130.31	.03	29	98	5.6	3.8	12	0	27	2.7	32	1100	1.82
10319780606	340653.50	.04	M 27	M 94	4.5	M 2.8	7	M 0	12	M 2.9	M 39	M1379	2.72
10319780614	340653.50	.11	25	90	5.1	1.7	31	M 0	37	3.2	49	1700	2.18
10319780620	102617.25	.01	M 26	M 95	5.0	M 2.4	10	M 0	7	M 4.0	M 163	M1814	1.71
10319780628	87352.44	.03	27	100	5.5	3.0	10	0	24	4.7	230	1900	2.04
10319780705	47440.23	.07	M 26	M 110	5.6	M 3.6	7	M 0	13	M 7.2	M1556	M2433	3.95
10319780712	34299.21	.05	26	120	5.9	4.2	6	0	32	9.5	2700	2900	6.10
10319780718	32843.54	.01	M 28	M 109	5.9	M 7.8	4	M 0	12	M14.0	M4423	M5484	1.93
10319780725	46997.48	.01	31	100	6.3	11.0	18	0	105	18.0	5900	7700	1.26
10319780801	59416.23	.01	M 29	M 105	6.2	M 6.3	8	M 0	19	M13.2	M2984	M7230	1.76
10319780808	77947.06	.58	28	111	5.9	1.7	6	0	18	8.5	68	6800	3.25
10319780814	672243.50	.15	M 28	M 105	3.7	M 1.0	7	M 0	8	M 8.3	M5415	M6423	1.93
10319780823	826326.81	G .02	28	100	5.2	0.4	12	0	16	8.3	9999	6100	2.66
10319780829	65608.25	.03	M 28	M 111	5.6	M .4	10	M 0	18	M 7.8	M5439	M2518	2.10
10319780905	50457.82	.00	28	120	5.7	0.4	12	0	23	7.5	2400	130	1.94
10319780912	31533.82	.01	M 27	M 127	6.2	M 1.1	11	M 0	14	M 6.9	M3200	M2065	1.90
10319780919	23628.64	.07	27	135	6.5	2.0	6	0	11	6.3	4000	4000	1.34
10319780926	17617.50	.30	M 26	M 117	6.7	M 2.1	4	M 0	9	M 6.6	M2216	M6999	2.44
10319781003	24067.98	.70	25	100	6.4	2.3	5	0	16	7.0	433	9999	3.00
10319781010	28235.28	.80	M 19	M 87	5.9	M 3.6	3	M 0	9	M 7.5	M 238	M5666	2.86
10319781017	19156.25	.06	14	75	6.0	5.1	5	0	21	8.0	43	1333	1.51
10319781025	18252.22	.02	M 14	M 81	5.9	M 3.6	3	M 0	9	M 6.9	M1105	M2670	1.37
10319781031	10232.32	.00	16	90	6.0	2.0	4	0	16	5.8	2320	4200	3.95
10319781109	13929.60	.03	M 16	M 84	6.0	M 2.1	4	M 0	22	M 6.5	M1400	M2720	2.46
10319781114	18518.60	.06	17	75	6.2	M 2.3	5	0	19	7.7	40	500	3.08
10319781121	20646.88	.00	M 14	M 75	6.0	M 2.4	4	M 0	9	M 8.2	M 38	M 580	2.92
10319781128	19984.42	.00	12	75	6.0	2.6	6	0	32	9.0	36	M 693	1.20
10319781205	208604.81	.16	M 9	M 82	5.3	M 3.0	12	M 0	22	M 5.6	M 100	M 806	3.04
10319781213	231840.75	.42	06	90	5.8	3.6	9	0	3	2.2	340	920	9.10
10319781219	78168.56	.04	M 5	M 72	5.9	M 4.2	13	M 0	20	M 1.9	M 235	M 611	2.24
10319781228	352244.75	.08	05	60	4.5	4.7	6	0	7	1.8	157	380	1.57
10319790104	1604400.00	.12	M 7	M 88	3.9	M 4.9	4	M 0	22	M 1.4	M 259	M 490	.95

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
103197800110	372341.50	0.3	2.88	55	9.8	M 6.4	M .0	M11.1	M 3.1	M .01	M 3.1	M .05	M .05	M .00
103197800117	783405.13	0.4	3.00	53	9.7	M 6.4	M .0	M10.4	M 2.9	M .01	M 2.7	M .04	M .04	M .00
103197800124	2706238.00	M .4	M2.82	M 42	M 8.6	M 6.4	M .0	M 9.4	M 2.6	M .01	M 2.1	M .03	M .03	M .00
103197800131	526838.38	0.4	2.64	32	7.6	M 6.4	M .0	M 8.4	M 2.4	M .01	M 1.6	M .02	M .02	M .00
103197800207	205669.56	0.4	2.84	43	9.3	6.4	0.0	7.5	2.3	.02	1.2	.02	.03	.00
103197800216	97400.00	0.6	1.48	27	7.4	M 5.9	M .2	M 7.7	M 2.2	M .02	M 1.1	M .02	M .02	M .00
103197800224	432566.31	0.6	1.81	26	8.0	M 5.3	M .5	M 7.9	M 2.1	M .02	M 1.0	M .02	M .01	M .00
103197800228	254517.88	0.3	2.14	26	7.8	M 4.7	M .8	M 8.2	M 2.0	M .02	M .9	M .02	M .01	M .00
103197800308	1425469.00	0.3	2.50	27	9.9	4.5	1.1	8.4	2.1	.03	0.9	.03	.02	.00
103197800314	391770.25	0.1	2.70	30	8.9	M 5.0	M .7	M 9.8	M 2.4	M .02	M 1.5	M .03	M .03	M .00
103197800321	178921.19	0.2	2.47	47	8.2	M 5.4	M .5	M10.8	M 2.6	M .01	M 1.9	M .03	M .04	M .00
103197800329	257028.44	0.3	2.00	50	8.5	M 5.9	M .2	M12.0	M 2.8	M .00	M 2.4	M .03	M .06	M .00
103197800405	132786.00	0.9	2.31	59	9.7	6.5	0.0	13.5	3.2	.00	3.1	.00	.09	.00
103197800412	55977.84	M .7	M1.75	M 50	M 8.3	M 6.2	M .0	M11.7	M 2.9	M .00	M 2.9	M .04	M .09	M .00
103197800419	100619.00	0.6	1.20	41	6.9	M 5.9	M .0	M 9.9	M 2.6	M .00	M 2.7	M .03	M .07	M .00
103197800425	170797.25	0.9	1.08	36	7.4	M 5.7	M .0	M 8.1	M 2.3	M .00	M 2.5	M .02	M .06	M .00
103197800427	973532.75	0.5	2.26	62	5.4	M 5.5	M .0	M 6.5	M 2.0	M .00	M 2.3	M .02	M .05	M .00
103197800502	1045096.63	0.9	2.49	48	5.8	5.5	0.0	6.1	2.0	.01	M 2.2	.03	.05	.00
103197800510	1422941.00	0.2	2.23	42	6.1	M 5.3	M .0	M 6.6	M 2.0	M .01	M 2.1	M .02	M .04	M .00
103197800516	691923.81	<.1	2.29	85	7.7	M 5.1	M .0	M 7.5	M 2.0	M .01	M 2.0	M .01	M .03	M .00
103197800522	231285.38	0.3	2.31	52	5.8	M 5.0	M .0	M 8.2	M 2.0	M .01	M 1.9	M .01	M .02	M .00
103197800529	89130.31	0.2	1.97	51	7.6	M 4.9	M .0	M 8.9	M 2.1	M .01	M 1.8	M .01	M .01	M .00
103197800606	340653.50	1.0	1.54	88	5.5	4.8	0.0	9.8	2.3	.01	1.8	.02	.02	.00
103197800614	340653.50	0.3	1.99	92	5.2	M 4.8	M .0	M10.3	M 2.4	M .00	M 2.1	M .02	M .02	M .00
103197800620	102617.25	0.2	1.78	76	7.1	M 4.8	M .0	M10.8	M 2.6	M .00	M 2.4	M .02	M .02	M .00
103197800628	87352.44	0.4	1.46	82	6.4	M 4.8	M .0	M11.1	M 2.7	M .00	M 2.7	M .02	M .02	M .00
103197800705	47440.23	0.7	1.57	93	7.9	4.8	0.0	11.7	3.0	.00	3.2	.04	.03	.00
103197800712	34299.21	1.4	2.45	90	8.0	M 4.3	M .0	M11.1	M 2.7	M .00	M 2.5	M .03	M .02	M .00
103197800718	32843.54	0.3	0.37	44	7.1	M 3.8	M .0	M10.5	M 2.5	M .00	M 1.9	M .02	M .01	M .00
103197800725	46997.48	0.2	0.26	M 48	7.1	M 3.4	M .0	M 9.9	M 2.3	M .00	M 1.3	M .01	M .01	M .00
103197800801	59416.23	0.3	0.36	33	6.4	3.0	0.0	9.4	2.2	.01	0.8	.02	.01	.00
103197800808	77947.06	<.1	0.48	56	6.3	M 4.0	M 3.9	M10.0	M 2.3	M .00	M .8	M .01	M .01	M .00
103197800814	672243.50	0.2	1.63	76	4.8	M 5.0	M 6.1	M10.6	M 2.4	M .00	M .9	M .01	M .01	M .00
103197800823	826326.81	0.4	1.93	73	8.7	M 5.8	M 8.7	M11.1	M 2.5	M .00	M 1.0	M .01	M .01	M .00
103197800829	65608.25	0.2	1.30	66	8.5	M 7.1	M12.7	M11.9	M 2.8	M .00	M 1.1	M .01	M .02	M .00
103197800905	50457.82	<.1	0.61		8.3	8.1	15.8	12.6	3.1	.00	1.3	.02	.03	.00
103197800912	31533.82	0.2	0.51		9.4	M 7.2	M11.8	M11.1	M 2.5	M .00	M 1.3	M .02	M .02	M .00
103197800919	23628.64	.2	0.39		9.8	M 6.4	M 8.1	M 9.6	M 2.0	M .00	M 1.3	M .02	M .02	M .00
103197800926	17617.50	<.1	0.46		10.2	M 5.5	M 4.5	M 8.2	M 1.5	M .00	M 1.4	M .02	M .02	M .00
103197801003	24067.98	0.2	0.49		9.8	4.8	1.0	6.9	1.0	.01	1.5	.04	.03	.00
103197801010	28235.28	<.1	0.42		9.3	M 4.8	M 1.1	M 7.4	M 1.2	M .00	M 1.6	M .04	M .02	M .00
103197801017	19156.25	<.1	0.13		9.3	M 4.8	M 1.2	M 7.9	M 1.4	M .00	M 1.7	M .04	M .01	M .00
103197801025	10252.22	<.1	0.07		8.8	M 4.8	M 1.3	M 8.4	M 1.6	M .00	M 1.8	M .04	M .00	M .00
103197801031	10232.32	<.1	0.18		9.1	M 4.8	M 1.4	M 9.0	M 1.9	M .00	M 1.9	M .04	M .00	M .00
103197801109	13929.60	<.1	0.43		9.4	M 4.8	M 1.5	M 9.4	M 2.1	M .00	M 2.0	M .04	M .00	M .00
103197801114	18318.60	<.1	0.30		9.1	M 4.8	M 1.6	M10.1	M 2.4	M .00	M 2.1	M .04	M .00	M .00
103197801121	20646.00	0.1	0.24		9.1	M 4.8	M 1.7	M10.5	M 2.6	M .00	M 2.2	M .04	M .00	M .00
103197801128	19984.42	<.1	0.16		8.9	M 4.8	M 1.8	M11.1	M 2.9	M .00	M 2.4	M .04	M .00	M .00
103197801205	208604.81	0.4	1.43		9.2	4.9	2.0	11.8	3.2	.00	2.6	.05	.00	.00
103197801213	231840.75	0.3	1.48		9.0	M 5.0	M 1.9	M11.0	M 2.9	M .00	M 2.2	M .04	M .00	M .00
103197801219	78168.56	1.2	1.37		8.6	M 5.1	M 1.8	M10.0	M 2.6	M .00	M 1.8	M .03	M .00	M .00
103197801228	352244.75	0.6	1.39		9.4	M 5.2	M 1.8	M 9.3	M 2.4	M .00	M 1.5	M .02	M .00	M .00
103197901004	1604400.06	0.4	1.78		9.9	5.5	1.8	8.4	2.2	.01	1.1	.02	.01	.00

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10319790109	473091.75	.22	09	110	3.8	5.2	4	0	5	1.2	340	590	1.29
10319790116	1558277.00	.28	M 9	M 101	3.7	M 5.5	4	M 0	6	M 1.3	M 360	M 760	1.76
10319790123	671923.69	.30	09	90	4.2	6.0	15	M 0	10	1.5	390	1000	2.02
10319790130	568902.13	.03	M 7	M 80	4.5	M 4.6	8	M 0	15	M 1.3	M1695	M2900	1.20
10319790206	151298.69	.00	05	70	5.9	3.3	5	0	20	1.1	3000	4800	2.13
10319790213	225204.06	.07	M 7	M 83	5.3	M 3.9	2	M 0	11	M 1.4	M2199	M3521	1.48
10319790222*	459660.31	.09	M 9	M 97	3.9	M 4.6	3	M 0	39	M 1.7	M1398	M2243	1.29
10319790227	1613143.00	.16	12	115	3.7	5.6	2	M 0	31	M 2.1	370	600	1.68
10319790307	731390.75	.01	M 11	M 97	3.9	M 5.1	2	M 0	7	M 2.4	M 766	M1253	1.34
10319790313	664075.63	.00	11	70	4.2	4.5	2	0	2	2.9	1400	2300	1.57
10319790320	276649.81	.06	M 14	M 70	5.0	M 4.2	2	M 0	4	M 3.7	M3368	M5833	.87
10319790327	133264.81	.02	18	70	5.6	4.0	4	0	14	4.8	9999	9999	0.84
10319790405	140634.75	.04	M 17	M 67	5.3	M 3.3	4	M 0	39	M 4.4	M6324	M7024	1.37
10319790411	195632.81	.00	16	65	5.9	2.8	4	0	10	4.0	1600	3200	1.93
10319790417	413188.50	.00	M 18	M 80	4.4	M 2.9	2	M 0	22	M 3.7	M1235	M2850	1.29
10319790424	245719.00	.00	20	95	5.5	3.4	3	0	10	3.8	870	2300	1.15
10319790501	286758.56	.04	M 23	M 82	5.3	M 2.2	2	M 0	8	M 3.5	M 585	M2000	1.15
10319790509	227534.44	.07	27	70	8.7	1.1	5	0	29	3.6	300	1500	1.46
10319790516	223788.31	.12	M 24	M 80	4.1	M 1.3	2	M 0	8	M 3.5	M3472	M6032	2.72
10319790522	379883.25	.01	22	90	4.4	1.6	2	0	8	3.8	9999	9999	1.71
10319790529	480125.50	.03	M 22	M 83	4.8	M 2.5	2	M 6	6	M 3.9	M5984	M6491	1.54
10319790606	474992.19	C .03	24	75	4.9	3.6	2	0	M 19	4.4	1300	2400	1.88
10319790612	149136.88	.02	M 24	M 83	5.6	M 2.3	4	M 0	35	M 3.7	M1520	M2651	4.19
10319790619	121684.81	.03	25	90	6.0	1.4	4	0	12	3.2	M1699	M2839	1.63
10319790626	85466.00	.01	M 25	M 96	6.7	M 2.4	2	M 0	16	M 3.9	M1899	M3039	1.92
10319790703	158839.56	C .01	M 25	M 102	6.7	M 3.4	4	M 0	26	M 4.7	M2049	M3279	2.60
10319790710	90911.94	.08	M 25	M 109	6.1	M 4.4	2	M 0	14	5.6	2300	3300	2.06
10319790717	82903.02	.03	M 26	M 116	6.3	M 5.4	1	M 0	0	M 6.0	M6149	M2900	1.76
10319790723	135522.38	.12	27	M 123	5.9	M 6.4	1	0	16	6.5	9999	2300	2.03

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10319790109	473091.75	0.2	2.05		8.9	M 4.8	M 1.4	M 6.7	M 1.8	M .01	M .9	M .01	M .01	M .00
10319790116	1558277.00	.3	2.17		8.6	M 4.3	M 1.1	M 5.4	M 1.8	M .01	M .7	M .00	M .01	M .00
10319790123	671923.69	.8	2.15		9.2	M 3.6	M .7	M 3.7	M 1.1	M .01	M .5	M .00	M .01	M .00
10319790130	568902.13	.2	1.93		9.5	M 2.9	M .3	M 2.0	M .7	M .01	M .4	M .00	M .01	M .00
10319790206	151298.69	.4	1.70		9.3	2.4	0.0	0.4	0.5	.02	0.3	.00	.02	.00
10319790213	225204.06	.5	1.68		9.7	M 2.9	M .1	M 1.6	M .8	M .01	M .4	M .00	M .01	M .00
10319790222	459660.31	.2	1.34		7.8	M 3.4	M .2	M 2.8	M 1.0	M .00	M .5	M .00	M .00	M .00
10319790227	1613143.00	<.1	1.83		7.9	M 4.1	M .3	M 4.4	M 1.4	M .00	M .8	M .01	M .00	M .00
10319790307	731390.75	<.1	1.74		8.3	4.5	0.5	5.4	1.7	.00	1.0	.02	.00	.00
10319790313	664075.63	<.1	1.84		8.5	M 4.6	M .3	M 6.5	M 1.9	M .00	M 1.2	M .01	M .00	M .00
10319790320	276649.81	<.1	1.59		9.4	M 4.7	M .2	M 7.4	M 2.0	M .00	M 1.3	M .01	M .00	M .00
10319790327	133264.81	<.1	1.16		8.8	M 4.0	M .1	M 8.4	M 2.1	M .00	M 1.5	M .01	M .00	M .00
10319790405	140634.75	.1	1.09		9.4	5.0	0.0	9.5	2.4	.00	1.8	.02	.00	.00
10319790411	195652.81	.1	1.47		7.5	M 4.9	M .1	M 9.3	M 2.2	M .00	M 1.7	M .02	M .00	M .00
10319790417	413188.50	<.1	1.37		7.0	M 4.9	M .1	M 9.1	M 2.1	M .00	M 1.6	M .02	M .00	M .00
10319790424	245719.00	<.1	1.38		7.3	M 4.9	M .2	M 9.0	M 2.0	M .00	M 1.5	M .02	M .00	M .00
10319790501	286758.56	<.1	1.31		6.8	4.9	0.4	8.9	2.0	.02	1.6	.03	.00	.00
10319790509	227534.44	<.1	1.23		6.8	M 4.9	M .4	M 9.3	M 2.0	M .01	M 1.6	M .02	M .00	M .00
10319790516	223788.31	.1	1.42		6.3	M 4.9	M .4	M 9.7	M 2.0	M .01	M 1.6	M .01	M .00	M .00
10319790522	379883.25	<.1	1.01		6.5	M 4.9	M .4	M10.1	M 2.0	M .01	M 1.6	M .01	M .00	M .00
10319790529	480125.50	<.1	1.80		6.3	M 4.9	M .4	M10.4	M 2.0	M .01	M 1.6	M .01	M .00	M .00
10319790606	474992.19	<.1	1.59		6.4	M 4.9	M .4	M10.8	M 2.0	M .01	M 1.6	M .01	M .00	M .00
10319790612	149156.88	1.8	1.44		6.7	M 4.9	M .4	M11.2	M 2.1	M .01	M 1.7	M .01	M .00	M .00
10319790619	121684.81	.2	1.00		7.0	M 4.9	M .4	M11.5	M 2.1	M .01	M 1.7	M .01	M .00	M .00
10319790626	85466.00	.3	0.84		7.5	M 5.0	M .4	M11.9	M 2.2	M .01	M 1.8	M .01	M .00	M .00
10319790703	158839.56	1.2	0.63		7.8	M 5.1	M .4	M12.3	M 2.3	M .01	M 1.9	M .01	M .01	M .00
10319790710	90911.94	<.1	0.87		7.1	M 5.2	M .4	M12.7	M 2.4	M .01	M 2.0	M .01	M .02	M .00
10319790717	82903.02	.2	0.49		7.2	M 5.3	M .4	M13.2	M 2.5	M .01	M 2.1	M .01	M .03	M .00
10319790723	135522.38	.3	0.83		6.3	M 5.4	M .4	M13.7	M 2.6	M .01	M 2.2	M .01	M .04	M .00

Appendix D (Cont'd)

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CONCENTRATION TABLE
  ST. DATE     FLOW VOLUME   NO3-N     T C    COND      PH     D.O    TURB     SAL     F.S     BOD  COL-F  COL-T    TKN
 10419760714     565432.63     .01      25     115     3.6     4.2    <25       0      14     3.1      0     53   0.98
 10419760721     414979.44   M .00  M  26  M  107  M  3.6  M  4.1  M  25  M    0  M   10  M  2.6  M   1  M  81  M1.15
 10419760727     311532.00     .00      27     100     3.7     4.1    <25       0       6     2.3      2    110   1.32
 10419760803     179052.31     .00      23     100     3.7  M  4.0    <25       0      18  M  2.7  M  10  M 137   1.06
 10419760810     104174.81     .00      29     100     3.7     4.0  M  25       0       4     3.2     21    170   1.12
 10419760817     169443.88     .00  M   28  M  105     3.9  M  3.5  M  25  M    0      22  M  3.1  M  11  M 105   1.15
 10419760824      36446.12     .00      28     110     3.8     3.1  M  25       0       3     3.2      2     40   1.32
 10419760831       6642.09     .00      30     100     3.8  M  2.9  M  25       0      21  M  3.1  M   2  M  47   1.32
 10419760907          3.20   M .00      27      91  M  5.3     2.7  M  25       0  M   11  M  3.0  M   2  M  54  M1.48
 10419760916          0.00     .01      23      60     6.9  M  2.8    <25       0       1  M  2.9  M   2  M  61   1.65
 10419760922          0.00   M .01  M   24  M   62  M  5.3  M  3.0  M  32  M    0  M   14  M  2.8  M   3  M  71  M1.91
 10419760928          0.00   C .01      25      65     4.3  M  3.1     37       0      24  M  2.8  M   3  M  78   2.10
 10419761005          0.00   M .00  M   23  M   63  M  4.2  M  3.2  M  34  M    0  M   19  M  2.8  M   4  M  85  M1.89
 10419761012          0.00   M .00  M   21  M   61  M  4.1  M  3.4  M  32  M    0  M   14  M  2.8  M   5  M  93  M1.64
 10419761019          0.00   C .00      20      60     4.2  M  3.6     30       0      10  M  2.8  M   6  M 101   1.40
 10419761026        381.01   C .00      24      50     4.5     3.9  M  27       0      15     2.8      8    110   1.57
 10419761102       2408.78   C .01       9      40     4.3  M  6.4    <25       0       5  M  3.4  M   4  M  58   1.18
 10419761109       8811.23     .01       8      50     4.6     9.1    <25       0      11     4.2      0      6   2.74
 10419761116       7451.48     .01       5      45     4.2  M  9.0    <25       0       4  M  2.8  M   0  M   7   1.98
 10419761122      55584.37     .02       9      60     4.2  M  9.0    <25       0       4     1.7      0      8   1.37
 10419761130      73047.31     .00  M    9  M   50     4.2  M  9.0    <25  M    0       5  M  2.9  M   0  M  10   1.04
 10419761207     129623.31     .00      10      40     3.8     9.1    <25       0       2     4.3      0     31   1.20
 10419761214     219173.50     .02       8      70     3.6  M  6.9    <25       0       1  M  2.6  M   0  M  20   0.98
 10419761220     585966.25     .02      11      90     3.5     4.8    <25       0       2     1.1      0     10   1.76
 10419761229     704028.00     .00  M    9  M   86     3.2  M  5.1    <25  M    0      12  M  1.0  M   0  M  10   1.04
 10419770113     422076.75     .00       6      80     2.9     5.7    <25       0       1     1.0      0     11   1.20
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CONCENTRATION TABLE
  ST. DATE     FLOW VOLUME    NH4-N       P     TOC      CL      NA       K      CA      MG      CU      FE      MN      ZN      CD
 10419760707     565432.63      <.1     .04      56     3.4  M  3.5  M   .0  M   .2  M   .7  M  .00  M  1.0  M  .01  M  .01  M  .00
 10419760721     414979.44   M   .0  M  .03  M   60  M  4.0  M  3.5  M   .0  M   .1  M   .6  M  .00  M   .9  M  .00  M  .01  M  .00
 10419760727     311532.00      <.1     .06      65     4.8  M  3.5  M   .0  M   .1  M   .6  M  .00  M   .8  M  .00  M  .01  M  .00
 10419760803     179052.31      <.1     .06      56     3.3     3.5     0.0     0.2     0.7     .00     0.8     .00     .01     .00
 10419760810     104174.81      <.1     .06      66     3.4  M  3.3  M   .0  M   .4  M   .7  M  .00  M   .8  M  .00  M  .01  M  .00
 10419760817     169443.88      <.1     .10      59     3.9  M  3.1  M   .0  M   .6  M   .7  M  .00  M   .8  M  .00  M  .01  M  .00
 10419760824      36446.12      <.1     .11      68     3.9  M  2.9  M   .0  M   .8  M   .7  M  .00  M   .8  M  .00  M  .01  M  .00
 10419760831       6642.09      <.1     .08      57     4.2  M  2.7  M   .0  M  1.0  M   .7  M  .00  M   .8  M  .00  M  .01  M  .00
 10419760907          3.20   M   .0  M  .05  M   61  M  4.0  M  2.5  M   .0  M  1.2  M   .7  M  .00  M   .9  M  .01  M  .01  M  .00
 10419760916          0.00      <.1     .03      66  M  3.9     2.5     0.0     1.5     0.8     .00     1.1     .02     .01     .00
 10419760922          0.00   M   .2  M  .01  M   77  M  3.7  M  2.5  M   .0  M  1.7  M   .9  M  .00  M  1.0  M  .01  M  .01  M  .00
 10419760928          0.00       .3     .00      85     3.7  M  2.5  M   .0  M  1.8  M   .9  M  .00  M  1.0  M  .00  M  .01  M  .00
 10419761005          0.00   M   .2  M  .01  M   75  M  3.8  M  2.5  M   .0  M  1.9  M   .9  M  .00  M  1.0  M  .00  M  .01  M  .00
 10419761012          0.00   M   .1  M  .02  M   64  M  4.0  M  2.6  M   .1  M  2.1  M  1.0  M  .00  M  1.0  M  .00  M  .01  M  .00
 10419761019          0.00      <.1     .04      54     4.3  M  2.7  M   .2  M  2.3  M  1.1  M  .00  M  1.0  M  .00  M  .01  M  .00
 10419761026        381.01      <.1     .05      70     3.4  M  2.8  M   .3  M  2.5  M  1.2  M  .00  M  1.0  M  .00  M  .01  M  .00
 10419761102       2408.78      <.1     .06      23     4.3     3.0     0.5     2.8     1.4     .01     1.1     .00     .02     .00
 10419761109       8811.23      <.1     .06      68     4.3  M  2.9  M   .4  M  2.3  M  1.3  M  .00  M  1.1  M  .00  M  .01  M  .00
 10419761116       7451.48      <.1     .05      53     3.5  M  2.8  M   .3  M  1.9  M  1.2  M  .00  M  1.1  M  .00  M  .01  M  .00
 10419761122      55584.37      <.1     .06      50     4.6  M  2.7  M   .2  M  1.5  M  1.1  M  .00  M  1.1  M  .00  M  .01  M  .00
 10419761130      73047.31      <.1     .02      53     3.1  M  2.6  M   .1  M  1.1  M  1.0  M  .00  M  1.1  M  .00  M  .01  M  .00
 10419761207     129623.31      <.1     .07      77     4.4     2.5     0.0     0.7     1.0     .00     1.2     .02     .01     .00
 10419761214     219178.50      <.1     .09      57     3.9  M  2.3  M   .0  M   .5  M   .9  M  .00  M  1.1  M  .01  M  .00  M  .00
 10419761220     585966.25      <.1     .05      57     3.2  M  2.3  M   .0  M   .4  M   .8  M  .00  M  1.0  M  .00  M  .00  M  .00
 10419761229     704028.00      <.1     .04      77     3.8  M  2.1  M   .0  M   .3  M   .7  M  .00  M  1.0  M  .00  M  .00  M  .00
 10419770113     422076.75      <.1     .03      62     1.1     2.0     0.0     0.2     0.7     .00     1.0     .00     .00     .00
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Appendix D (Cont'd)

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CONCENTRATION TABLE
  ST. DATE     FLOW VOLUME    NO3-N     T C    COND      PH     D.O    TURB     SAL     F.S     BOD  COL-F  COL-T    TKN
 10419770119     793145.06      .40       4      85     5.5     5.0     <25       0      10   M 1.1  M   0  M   7   1.54
 10419770127     620081.69  C   .00       6      80     3.6     7.5     <25       0       4   M 1.1  M   0  M   6   0.64
 10419770131     204726.06  C   .00       3      70     3.7     8.1     <25       0       1     1.2      0      5   0.78
 10419770207     283671.19  C   .00       4      80     3.3    11.1     <25       0  M    1   M 1.3      1    440   1.34
 10419770216     251481.50  C   .02       7  M   75     3.5     8.8     <25  M    0       1     1.5      5     90   0.48
 10419770224     137351.88      .04     -01      70     3.8     9.8     <25       0       6   M 1.6  M   2  M  68   0.92
 10419770302     217720.13      .03      12      85     3.4     6.0     <25       0       5     1.7      1     50   0.78
 10419770310     373439.44      .01  M   13  M   87     3.5   M 5.6     <25  M    0       2   M 1.5  M   0  M  32   1.12
 10419770316     534740.19      .02      15      90     3.8     5.2     <25       0       2     1.3      0     10   0.76
 10419770323     622475.38      .04  M   16  M   94     3.5   M 6.3     <25  M    0       0   M 1.5  M   0  M   9   1.04
 10419770401     731503.63      .00      18     100     3.5     7.8     <25       0       3   M 1.8  M   0  M   9   0.98
 10419770406     193576.23      .07      16      95     3.8     6.3     <25       0       9     2.2      0      9   1.12
 10419770413     164125.06      .07  M   20  M  103     3.5   M 6.5     <25  M    0       1   M 3.3  M   0  M  10   1.40
 10419770420      94538.44      .06      27     115     3.7     6.8     <25       0       7     5.0      1     12   1.46
 10419770427      70137.63      .02  M   26  M  115     3.7   M 6.4      24  M    0      10   M 4.5  M   0  M  36   0.78
 10419770504      91259.94      .03      26     115     3.7     6.2     <25       0       6     4.0      0     61   1.21
 10419770511     277705.13      .00  M   24  M  112     3.6   M 5.5       5  M    0       4   M 3.4  M   0  M 140   0.84
 10419770519     323100.63      .00      23     110     3.5     5.0     <25       0       9     2.9      0    220   1.25
 10419770526     559225.81      .00  M   28  M  123     3.4   M 6.3     <25  M    0       7   M 3.0  M   0  M 246   1.20
 10419770601    1203478.00      .00      33     135     3.7     7.5     <25       0       5     3.1      1    270   1.12
 10419770608     569423.19      .00  M   30  M  118     3.5   M 6.6     <25  M    0       4   M 2.7  M   8  M 151    .91
 10419770614     208014.75      .00      28     100     3.5     5.6       2       0       8     2.4     18     13   2.55
 10419770621     106973.56      .00  M   28  M   99     3.7   M 5.4       2  M    0       8   M 5.5  M  12  M  30   1.12
 10419770629      51753.67      .00  M   29  M   98     3.6   M 5.1       8  M    0       7     9.3      5     81   1.26
 10419770706      75496.25      .00  M   30  M   98     3.6   M 4.8       3  M    0      27   M 5.5  M   4  M  93    .70
 10419770713      70736.63      .00      32      98     3.8     4.7       4       0       4     2.2  M   4    130   1.12
 10419770721      66311.94      .00  M   28  M   89     3.6   M 3.9       3  M    0      20   M 1.9  M   4  M 110   3.78
 10419770726      11388.63      .00      24      88     3.5     3.1       5       0       9     1.6      4     88   3.92
 10419770802       6191.18      .07  M   24  M   88     3.5   M 3.5       4  M    0      18   M 2.1  M   9  M 106   4.06
 10419770810       1139.05      .05  M   25  M   80     3.7   M 4.1  M    5  M    0  M   15   M 2.0  M  16  M 131   1.90
 10419770817       3760.01      .13      27      80     3.8     4.8       7  M    0      17     3.7     25    160   1.40
 10419770822     323459.44      .00      29     110     3.6     6.0       4       0      10     5.7      3     93  M1.23
 10419770830     300112.06      .00  M   29  M  111     3.5   M 5.6      30  M    0       7   M 6.3  M   2  M  69   1.12
 10419770906      83788.69      .06      31     115     3.8     5.2       3       0      19     7.3      1     31   0.84
 10419770913     364186.81      .03      25     100     3.7     4.5      28       0       7     2.4      7     77   1.12
 10419770920     224602.88      .06      26      95     3.7     1.4       3       0       5     4.1      1     17   1.96
 10419770927      77732.00      .03  M   22  M   87     3.9   M 2.8       3  M    0       9   M 2.8  M   6  M  45   1.82
 10419771004      33105.14      .00      19      80     3.8     4.3       3       0       4     1.6     11     73   1.23
 10419771011      16330.90      .00  M   17  M   77     4.4   M 6.0       4  M    0       5   M 3.9  M  11  M  56    .98
 10419771018     197053.06      .00      16      75     3.7     7.8      29       0       8     6.2     12     39   1.34
 10419771025     211204.00      .03  M   19  M   97     3.8   M 5.9      21  M    0       3   M 4.5  M   9  M  23   1.04
 10419771103    2536088.00      .07      23     120     3.8     4.1       3       0       4     2.9      7      8   1.43
 10419771108    1507543.00      .00  M   19  M  105     3.5   M 4.5       2  M    0       2   M 2.2  M   8  M  17   1.32
 10419771115    1986337.00  M   .02  M   17  M   97   M 3.4   M 4.7  M    2  M    0  M   11   M 1.8  M   9  M  22  M1.23
 10419771122     815044.38      .07  M   15  M   86     3.4   M 5.0       2  M    0      24   M 1.4  M  11  M  29   1.12
 10419771129     584786.19      .03      13      75     3.9     5.5      29       0       2     1.0     13     37    .98
 10419771206     434544.56      .00  M    8  M   70     3.9   M 6.5       2  M    0       6   M 1.7  M   9  M  73   1.12
 10419771212     386017.63      .06       4      63     3.8     7.5       2       0       2     2.5      8    110   1.96
 10419771220     546190.00      .09  M    4  M   68     3.6   M 7.0       2  M    0       3   M 2.4  M   4  M  90   1.06
 10419771230    1078354.00  M   .11  M    5  M   73   M 3.5   M 6.3  M    2  M    0  M    5   M 2.3  M   2  M  64  M1.09
 10419780105     927493.75      .14       7      88     3.6     5.8       4       0       9     2.3      1     32   1.18
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10419770119	793145.06	.3	1.83	35	13.5	M 3.1	M .2	M .4	M .5	M .00	M .7	M .03	M .04	M .00
10419770127	620081.69	<.1	.02	55	4.6	M 3.5	M .3	M .5	M .4	M .00	M .6	M .04	M .05	M .00
10419770131	284726.06	<.1	.05	55	3.9	M 4.1	M .4	M .6	M .3	M .00	M .5	M .05	M .07	M .00
10419770207	285671.19	.2	.03	61	6.2	4.5	0.5	0.8	0.3	.00	0.5	.07	.09	.00
10419770216	251481.50	<.1	.10	57	4.5	M 4.2	M .6	M .7	M .3	M .00	M .5	M .04	M .07	M .00
10419770224	137351.88	M .0	.08	53	4.8	M 3.8	M .8	M .5	M .3	M .00	M .5	M .01	M .04	M .00
10419770302	217728.13	<.1	.02	47	4.0	3.5	1.0	0.5	0.3	.00	0.6	.00	.03	.00
10419770310	373439.44	<.1	.04	54	3.7	M 3.3	M 1.1	M .4	M .3	M .00	M .7	M .00	M .02	M .00
10419770316	854740.19	<.1	.04	54	3.5	M 3.1	M 1.2	M .4	M .3	M .00	M .9	M .00	M .01	M .00
10419770323	622475.38	.1	.04	53	4.8	M 2.9	M 1.3	M .4	M .3	M .00	M 1.1	M .00	M .00	M .00
10419770401	731503.63	<.1	.04	41	3.5	2.8	1.5	0.4	0.4	.00	1.4	.00	.00	.00
10419770406	193576.25	<.1	.06	29	2.9	M 8.5	M 1.3	M .3	M .4	M .00	M 1.2	M .00	M .00	M .00
10419770413	164125.06	<.1	.02	88	3.7	M11.7	M 1.2	M .3	M .4	M .00	M 1.1	M .00	M .00	M .00
10419770420	94538.44	.4	.05	99	5.5	M16.1	M 1.1	M .3	M .4	M .00	M 1.0	M .00	M .00	M .00
10419770427	70137.63	<.1	.06	93	4.1	M20.6	M 1.0	M .3	M .4	M .00	M .9	M .00	M .00	M .00
10419770504	91259.94	<.1	.06	72	4.8	25.2	1.0	0.3	0.4	.00	0.9	.00	.01	.00
10419770511	277705.13	<.1	.04	58	5.2	M19.9	M 1.0	M .2	M .3	M .00	M .8	M .00	M .01	M .00
10419770519	323100.63	<.1	.08	60	3.5	M14.6	M 1.0	M .1	M .3	M .00	M .7	M .00	M .01	M .00
10419770526	559225.81	<.1	.03	63	3.2	M 8.6	M 1.0	M .1	M .3	M .00	M .6	M .00	M .01	M .00
10419770601	1203478.00	<.1	.05	72	3.5	3.5	1.1	0.2	0.3	.00	0.7	.00	.02	.00
10419770608	369425.19	<.1	.05	75	3.5	M 3.5	M 1.1	M .1	M .3	M .00	M .8	M .00	M .02	M .00
10419770614	208014.75	<.1	.12	79	3.4	M 3.5	M 1.1	M .0	M .3	M .00	M 1.0	M .00	M .02	M .00
10419770621	106973.56	<.1	.10	77	3.0	M 3.5	M 1.1	M .0	M .4	M .00	M 1.2	M .00	M .02	M .00
10419770629	51753.67	<.1	.13	68	4.2	M 3.5	M 1.2	M .0	M .5	M .00	M 1.4	M .00	M .02	M .00
10419770706	75496.25	<.1	.04	59	3.7	3.5	1.4	0.1	0.7	.00	1.8	.00	.03	.00
10419770713	70736.63	<.1	.04	66	4.1	M 3.4	M 1.1	M .0	M .6	M .00	M 1.6	M .00	M .04	M .00
10419770721	66311.94	<.1	.03	75	4.3	M 3.3	M .9	M .0	M .5	M .00	M 1.4	M .00	M .06	M .00
10419770726	11388.65	<.1	.06	78	3.9	M 3.2	M .7	M .0	M .5	M .00	M 1.3	M .01	M .08	M .00
10419770802	6191.18	.3	.04	79	5.1	3.2	0.6	0.1	0.6	.00	1.3	.02	.10	.00
10419770810	1139.05	.4	.07	75	5.1	M 3.2	M .4	M .1	M .6	M .00	M 1.2	M .01	M .08	M .00
10419770817	3760.01	<.1	.07	57	4.6	M 3.2	M .2	M .1	M .6	M .00	M 1.1	M .00	M .07	M .00
10419770822	323459.44	<.1	.07	48	4.4	M 3.2	M .1	M .2	M .6	M .00	M 1.1	M .00	M .06	M .00
10419770830	300112.06	<.1	.02	50	3.5	M 3.2	M .0	M .2	M .6	M .00	M 1.1	M .00	M .05	M .00
10419770906	83788.69	<.1	.06	36	3.5	3.4	0.0	0.4	0.7	.00	1.2	.00	.05	.00
10419770913	364186.81	<.1	.01	60	4.0	3.5	0.0	0.0	0.6	.02	0.8	.00	.02	.00
10419770920	224602.88	0.1	.04	63	4.4	M 3.6	M .3	M .2	M .6	M .01	M .8	M .00	M .01	M .00
10419770927	77732.00	<.1	.02	66	4.5	M 3.6	M .6	M .4	M .6	M .00	M .9	M .00	M .01	M .00
10419771004	33105.14	<.1	.08	62	4.3	4.0	1.0	.8	.8	.00	1.0	.00	.02	.00
10419771011	16330.90	<.1	.02	62	3.9	M 3.8	M .7	M .6	M .6	M .00	M .8	M .00	M .01	M .00
10419771018	197053.06	<.1	.00	59	3.9	M 3.6	M .4	M .5	M .4	M .00	M .6	M .00	M .01	M .00
10419771025	211204.00	<.1	.04	59	9.6	M 3.4	M .1	M .4	M .3	M .00	M .5	M .00	M .01	M .00
10419771103	2536088.00	.2	.06	50	0.0	3.3	0.0	.4	.2	.01	.5	.00	.01	.00
10419771108	1507543.00	<.1	.04	54	2.2	M 4.3	M .0	M 4.8	M .8	M .01	M .5	M .00	M .02	M .00
10419771115	1986337.00	M .0	M .06	M 57	M 2.6	M 4.9	M .0	M 7.2	M 1.1	M .01	M .5	M .00	M .02	M .00
10419771122	815044.38	<.1	.11	62	3.2	M 5.7	M .0	M10.6	M 1.6	M .01	M .6	M .00	M .03	M .00
10419771129	584786.19	<.1	.04	45	2.7	6.6	0.0	14.2	2.3	.02	.8	.00	.05	.00
10419771206	434544.56	<.1	.02	43	3.9	2.9	0.0	.7	.3	.00	.5	.00	.01	.00
10419771212	386017.63	<.1	.02	83	5.3	M 2.9	M .0	M .6	M .3	M .00	M .5	M .00	M .01	M .00
10419771220	846190.00	<.1	.01	65	3.1	M 2.9	M .0	M .5	M .3	M .00	M .8	M .00	M .01	M .00
10419771230	1878354.00	M .0	M .01	M 65	M 2.6	M 3.0	M .0	M .4	M .4	M .00	M .5	M .00	M .01	M .00
10419780105	927493.75	<.1	.03	65	2.0	3.2	0.0	0.4	0.6	.00	0.7	.01	.03	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10419780110	203093.94	M .08	M 8	M 74	M 3.6	M 5.2	M 2	M 0	M 4	M 1.4	M 4	M 32	M1.19
10419780117	800273.06	.04	10	70	3.7	5.0	2	0	0	0.7	8	32	1.23
10419780124	1798834.00	.01	M 8	M 72	3.5	M 5.3	2	M 0	4	M .7	M 4	M 76	0.95
10419780131	2130513.00	.00	6	73	3.8	5.6	1	0	0	0.8	0	120	0.93
10419780207	1420469.90	.01	M 5	M 67	3.7	M 6.0	2	M 0	8	M .8	M 0	M 210	0.81
10419780216	832178.31	.04	6	69	3.5	6.5	2	0	3	0.8	0	300	0.81
10419780224	627072.31	M .02	M 5	M 73	M 3.6	M 7.6	M 2	M 0	M 1	M 1.3	M 0	M 300	M .82
10419780228	267269.88	.01	5	90	3.8	8.6	3	0	1	2.3	0	309	0.84
10419780308	1137322.00	.01	M 7	M 83	3.8	M 7.5	7	M 0	32	M 2.7	M 0	M 201	0.78
10419780314	1007555.69	.07	13	70	3.7	5.6	3	0	7	3.7	0	3	0.87
10419780321	733302.75	.04	M 12	M 79	3.7	M 7.3	3	M 0	7	M 2.2	M 0	M 6	1.29
10419780329	718055.81	.05	11	90	3.7	9.5	3	0	1	0.6	1	11	0.90
10419780405	797041.31	.03	M 14	M 79	3.8	M 9.1	2	M 0	2	M 1.2	M 1	M 15	1.32
10419780412	338649.81	M .01	18	70	M 3.8	M 8.8	M 2	0	M 3	M 1.0	M 1	M 19	M .96
10419780419	180400.00	.00	16	70	3.8	8.5	2	M 0	5	2.5	1	24	0.62
10419780425	324408.31	.00	M 15	M 70	3.9	M 7.4	2	M 0	4	M 2.7	M 2	M 25	0.81
10419780427	263665.56	C .03	M 14	M 70	3.7	M 6.4	4	M 0	7	M 2.9	M 3	M 27	0.42
10419780502	1314420.00	.00	14	70	3.8	6.2	4	0	18	3.1	4	28	0.56
10419780510	1799240.00	.01	M 13	M 75	3.7	M 6.7	4	M 0	8	M 2.4	M 2	M 26	1.04
10419780516	1548321.00	.06	13	85	3.8	7.6	2	0	2	1.3	0	24	0.76
10419780522	1043696.59	.05	M 18	M 86	3.7	M 7.4	43	M 0	3	M 1.1	M 1	M 30	0.64
10419780529	1069925.00	.02	24	88	3.8	7.2	3	0	15	1.0	3	37	0.87
10419780606	708305.94	.03	M 22	M 85	3.8	M 5.7	2	M 0	4	M 1.3	M 3	M 50	0.81
10419780614	1224899.00	.06	21	83	3.7	4.0	3	0	2	1.7	3	67	1.15
10419780620	442198.88	.00	M 24	M 81	3.7	M 5.7	2	M 0	4	M 2.3	M 3	M 97	0.81
10419780628	256486.50	.01	28	80	3.8	7.1	4	0	14	2.8	3	120	1.06
10419780705	108859.75	.02	M 20	M 95	3.6	M 6.1	2	M 0	1	M 5.5	M 24	M 189	0.98
10419780712	36455.87	.00	29	110	3.8	5.4	3	0	12	8.0	43	250	1.04
10419780718	16182.46	.13	M 27	M 93	3.7	M 5.1	2	M 0	2	M 6.2	M 95	M 352	1.20
10419780725	23444.33	.01	27	79	3.8	5.0	4	0	7	4.7	140	440	1.29
10419780801	583806.56	.00	M 27	M 89	3.6	M 3.6	4	M 0	15	M 3.4	M 70	M 295	1.01
10419780808	1982387.00	.01	28	100	3.7	2.3	3	0	6	2.2	1	150	2.69
10419780814	911380.44	.00	M 29	M 89	3.7	M 4.1	3	M 0	2	M 3.6	M 33	M 214	1.29
10419780823	1673609.00	.00	30	80	3.9	5.7	4	0	2	4.9	61	270	1.26
10419780829	232537.50	.00	M 28	M 80	3.8	M 5.5	4	M 0	15	M 6.0	M 31	M 117	1.54
10419780905	91888.19	.00	27	80	3.9	5.5	2	0	4	6.1	11	16	1.32
10419780912	27483.02	.00	M 29	M 82	3.8	M 4.8	4	M 0	19	M 3.7	M 34	M 44	1.54
10419780919	5187.97	.04	31	85	3.9	4.1	2	0	5	2.4	M 57	73	1.34
10419780926	826.77	.00	M 28	M 70	3.9	M 5.0	1	M 0	2	M 3.5	M 80	M 271	1.48
10419781003	1169.93	.01	25	55	4.0	6.0	2	0	4	4.8	104	470	1.74
10419781010	6292.32	.02	M 20	M 50	3.9	M 6.1	2	M 0	5	M 3.3	M 32	M 285	1.48
10419781017	2671.21	.00	15	45	4.1	6.3	3	0	14	1.8	0	100	1.31
10419781025	230.64	.00	M 14	M 43	3.9	M 6.2	2	M 0	6	M 1.7	M 1	M 98	1.40
10419781031	0.00	M .00	M 13	M 48	M 3.9	M 6.1	M 2	M 0	M 6	M 1.6	M 2	M 78	M1.19
10419781109	0.00	M .00	M 12	M 45	M 3.9	M 6.1	M 2	M 0	M 6	M 1.5	M 2	M 69	M1.03
10419781114	0.00	M .00	M 10	M 45	M 3.9	M 6.1	M 2	M 0	M 6	M 1.3	M 3	M 86	M .80
10419781121	0.00	M .00	M 9	M 45	M 3.9	M 6.1	M 2	M 0	M 6	M 1.2	M 3	M 49	M .67
10419781128	0.00	M .00	M 8	M 45	M 3.9	M 6.1	M 2	M 0	M 6	M 1.1	M 4	M 39	M .50
10419781205	20033.61	.01	M 8	M 43	4.0	M 6.1	3	M 0	7	M 1.0	M 6	M 29	.34
10419781213	66058.94	.06	08	43	4.0	6.2	3	M 0	0	1.1	8	20	1.26
10419781219	42797.67	.00	M 6	M 53	4.0	M 6.7	2	M 0	5	M 1.3	M 8	M 65	1.96
10419781228	194707.31	.00	03	60	3.9	7.2	3	0	3	1.6	9	100	1.04
10419790104	553485.44	.01	M 7	M 76	4.0	M 5.6	3	M 0	4	M 1.2	M 8	M 70	1.09

Appendix D (Cont'd)

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CONCENTRATION TABLE
  ST. DATE      FLOW VOLUME    NH4-N       P      TOC      CL      NA       K      CA      MG      CU      FE      MN      ZN      CD
 10419780110 *   203093.94  M   .0  M  .02  M  61  M 1.4  M 3.1  M  .0  M  .4  M  .5  M .00  M  .6  M .00  M .02  M .00
 10419780117     800273.06     <.1     .03     39     0.9  M 3.0  M  .0  M  .4  M  .4  M .00  M  .5  M .00  M .01  M .00
 10419780124    1798834.00     <.1     .04     51     0.5  M 3.0  M  .0  M  .4  M  .3  M .00  M  .3  M .00  M .00  M .00
 10419780131    2130513.00     <.1     .03     54     2.4  M 3.0  M  .0  M  .4  M  .2  M .00  M  .5  M .00  M .00  M .00
 10419780207    1420469.00     <.1     .03     40     1.1    3.1    0.0     0.5     0.2     .01     0.6     .00     .00     .00
 10419780216     832170.31     <.1     .04     37     1.3  M 2.9  M  .0  M  .4  M  .2  M .01  M  .5  M .00  M .00  M .00
 10419780224     627872.31  M   .0  M  .04  M  37  M  .7  M 2.7  M  .0  M  .4  M  .3  M .02  M  .5  M .00  M .00  M .00
 10419780228     267269.88     <.1     .06     37     0.2  M 2.6  M  .1  M  .4  M  .4  M .03  M  .5  M .01  M .01  M .00
 10419780308    1137322.00     <.1     .04     38     3.3    2.6    0.2     0.4     0.6     .04     0.5     .02     .03     .00
 10419780314    1007535.69     <.1     .06     38     2.4  M 3.0  M  .1  M  .4  M  .5  M .02  M  .5  M .01  M .03  M .00
 10419780321     733382.73     <.1     .02     36     0.1  M 2.9  M  .0  M  .4  M  .5  M .01  M  .5  M .01  M .04  M .00
 10419780329     710055.81     0.2     .04     52     3.3  M 3.1  M  .0  M  .4  M  .5  M .00  M  .5  M .01  M .05  M .00
 10419780405     797041.31     <.1     .01     81     0.2    3.3    0.0     0.4     0.5     .00     0.7     .02     .03     .00
 10419780412     338649.81  M   .0  M  .01  M  45  M  .8  M 3.4  M  .0  M  .4  M  .3  M .00  M  .6  M .01  M .06  M .00
 10419780419     109400.00     <.1     .02     42     1.5  M 3.3  M  .6  M  .4  M  .5  M .00  M  .5  M .00  M .04  M .00
 10419780425     324498.31     <.1     .03     41     1.8  M 3.3  M  .0  M  .4  M  .5  M .00  M  .4  M .00  M .03  M .00
 10419780427     263065.56     0.2     .03     38     0.3  M 3.1  M  .0  M  .4  M  .5  M .00  M  .4  M .00  M .02  M .00
 10419780502    1314420.00     <.1     .06     45     0.8    3.3    0.0     0.5     0.6     .01  M  .4     .00     .03     .00
 10419780510    1799240.00     <.1     .03     34     0.2  M 3.0  M  .0  M  .4  M  .5  M .01  M  .4  M .00  M .01  M .00
 10419780516    1348321.00     <.1     .01     47     3.9  M 2.8  M  .0  M  .3  M  .4  M .01  M  .4  M .00  M .01  M .00
 10419780522    1043995.50     <.1     .03     51     8.8  M 2.7  M  .0  M  .2  M  .3  M .01  M  .4  M .00  M .01  M .00
 10419780529    1089929.00     <.1     .04     38     0.2  M 2.6  M  .0  M  .1  M  .2  M .01  M  .4  M .00  M .01  M .00
 10419780606     780305.94     <.1     .02     66     8.8    2.5    0.3     0.2     0.3     .01     0.4     .00     .02     .00
 10419780614    1224099.00     <.1     .04     70     5.9  M 2.5  M  .0  M  .3  M  .3  M .00  M  .4  M .00  M .01  M .00
 10419780620     443198.88     <.1     .18     57     4.1  M 2.8  M  .0  M  .2  M  .3  M .00  M  .4  M .00  M .01  M .00
 10419780628     255406.50     <.1     .23     72     6.1  M 2.9  M  .0  M  .2  M  .3  M .04  M  .4  M .03  M .01  M .00
 10419780705     100827.75     <.1     .08     27     8.6    3.2    0.0     0.4     0.4     .00     0.6     .01     .02     .00
 10419780712      36435.87     <.1     .03     31     9.3  M 2.6  M  .0  M  .4  M  .4  M .00  M  .5  M .01  M .03  M .00
 10419780718      16182.46     <.1     .08     37     2.0  M 3.1  M  .0  M  .4  M  .4  M .00  M  .4  M .01  M .02  M .00
 10419780725      23444.33     <.1     .03     39     2.5  M 1.9  M  .0  M  .4  M  .4  M .00  M  .4  M .01  M .02  M .00
 10419780801     383806.56     <.1     .21     96     1.2    1.2    0.0     0.4     0.4     .02     0.4     .01     .01     .00
 10419780808    1982287.00     <.1     .03  M  40     0.2  M 2.9  M 1.9  M  .3  M  .5  M .01  M  .4  M .00  M .03  M .00
 10419780814     911330.44     <.1     .12     54     0.1  M 3.6  M 2.7  M  .2  M  .6  M .00  M  .4  M .00  M .02  M .00
 10419780823    1673609.00     <.1     .04     64     0.8  M 3.7  M 4.2  M  .1  M  .7  M .00  M  .4  M .00  M .01  M .00
 10419780829     232537.38     <.1    1.22     56     9.4  M 6.3  M 6.1  M  .1  M  .9  M .00  M  .4  M .00  M .01  M .00
 10419780905      91888.19     <.1     .03            0.2    7.5    7.5     0.2     1.1     .00     0.4     .00     .01  M .00
 10419780912      27483.02     <.1     .04            1.2  M 6.5  M 5.6  M  .2  M  .9  M .00  M  .4  M .00  M .02  M .00
 10419780919       5187.97     <.1     .02            0.7  M 3.5  M 3.8  M  .2  M  .7  M .00  M  .5  M .00  M .03  M .00
 10419780926        826.77     <.1     .05            0.6  M 4.5  M 2.9  M  .2  M  .6  M .00  M  .6  M .00  M .04  M .00
 10419781003       1169.95     0.2     .05            1.0    3.6    0.2     0.3     0.5     .01     0.8     .01     .06     .00
 10419781010       5292.32     <.1     .06            0.4  M 3.6  M  .3  M  .3  M  .3  M .00  M  .7  M .00  M .05  M .00
 10419781017       2671.21     <.1     .03            1.4  M 3.6  M  .5  M  .3  M  .3  M .00  M  .6  M .00  M .03  M .00
 10419781025        230.64     <.1     .04            1.9  M 3.6  M  .7  M  .3  M  .3  M .00  M  .3  M .00  M .05  M .00
 10419781031          0.00  M   .1  M  .04         M 2.0  M 3.6  M  .9  M  .3  M  .5  M .00  M  .5  M .00  M .05  M .00
 10419781109          0.00  M   .1  M  .04         M 2.0  M 3.6  M 1.0  M  .3  M  .5  M .00  M  .5  M .00  M .05  M .00
 10419781114          0.00  M   .1  M  .04         M 2.1  M 3.6  M 1.3  M  .3  M  .5  M .00  M  .5  M .00  M .05  M .00
 10419781121          0.00  M   .1  M  .04         M 2.2  M 3.6  M 1.4  M  .3  M  .5  M .00  M  .3  M .00  M .05  M .00
 10419781128          0.00  M   .2  M  .04         M 2.3  M 3.6  M 1.6  M  .3  M  .5  M .00  M  .3  M .00  M .05  M .00
 10419781205      20053.61     0.4     .04            2.5    3.7    2.0     0.4     0.5     .00     0.6     .00     .05     .00
 10419781213      66058.94     <.1     .03            0.5  M 3.4  M 1.6  M  .4  M  .5  M .00  M  .6  M .00  M .04  M .00
 10419781219      42797.67      .1     .08            5.0  M 3.1  M 1.2  M  .4  M  .4  M .00  M  .6  M .00  M .02  M .00
 10419781228     194707.31     <.1     .09            2.8  M 2.9  M  .9  M  .4  M  .4  M .00  M  .6  M .00  M .01  M .00
 10419790104     553483.44     <.1     .03            3.8    2.7    0.7     0.4     0.4     .02     0.7     .00     .01     .00
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10419790109	996480.38	.03	10	90	3.9	4.5	3	M 0	4	0.9	3	47	1.29
10419790116	1794647.00	.03	M 8	M 85	3.6	M 5.7	3	M 0	22	M 1.9	M 2	M 27	1.01
10419790123	1382566.00	.00	7	80	3.6	7.6	4	0	7	1.3	1	1	1.34
10419790130	1120378.00	.00	M 6	M 77	3.6	M 7.8	8	M 0	8	M .7	M 0	M 4	2.60
10419790206*	616930.44	.00	5	73	4.0	8.0	2	M 0	6	9.2	6	8	.98
10419790213	356090.88	.04	M 7	M 82	3.9	M 7.3	1	M 0	8	M .7	M 2	M 8	1.20
10419790222	350964.13	.03	M 9	M 89	3.4	M 6.5	1	M 0	6	M 1.3	M 5	M 8	.95
10419790227	713895.75	.06	12	100	3.7	5.7	1	0	21	2.1	9	9	1.15
10419790307	1504735.00	.00	M 13	M 88	3.7	M 5.6	1	M 0	2	M 2.2	M 7	M 7	.92
10419790313	1270164.00	.09	15	70	3.8	6.7	2	0	10	2.5	5	4	1.29
10419790320	700674.25	.01	M 14	M 74	3.8	M 6.0	1	M 0	2	M 2.4	M 3	M 3	.76
10419790327	431151.38	.00	14	80	3.8	6.4	2	0	18	2.4	0	3	.84
10419790405	576411.13	.03	M 15	M 82	3.9	M 6.1	2	M 0	20	M 2.0	M 0	M 4	.90
10419790411	448114.75	.00	18	87	3.8	5.8	1	0	M 29	1.5	1	7	.86
10419790417	634493.69	.00	M 19	M 85	3.7	M 6.0	1	M 0	16	M 2.3	M 14	M 53	1.43
10419790424	523366.25	.00	21	85	3.8	6.5	2	M 0	6	3.1	20	100	1.83
10419790501	483969.19	.04	M 23	M 87	3.7	M 6.6	1	M 0	M 10	M 2.6	M 14	M 71	2.18
10419790509	360482.69	.06	25	90	3.8	7.0	2	0	14	2.5	8	43	.93
10419790516	298377.94	.01	M 23	M 76	3.7	M 6.2	2	M 0	4	M 2.0	M 6	M 40	1.01
10419790522	641554.69	.00	23	65	3.7	5.6	1	0	2	1.9	12	39	1.29
10419790529	661021.75	.00	M 23	M 71	3.7	M 5.1	1	M 0	1	M 2.4	M 30	M 76	1.06
10419790606	372663.88	.01	23	80	3.8	4.7	1	0	M 4	3.2	52	120	1.23
10419790612	204249.01	.01	M 23	M 74	3.8	M 3.1	1	M 0	8	M 3.0	M 43	M 100	1.23
10419790619	118744.44	.00	25	70	3.8	3.5	2	0	8	3.5	M 40	M 85	1.26
10419790626	57797.07	G .00	M 25	M 71	4.0	M 5.3	1	M 0	2	M 3.9	M 34	M 68	1.35
10419790703	50466.70	G .00	M 26	M 72	4.0	M 5.1	2	M 0	20	M 4.3	M 28	M 52	1.53
10419790710	31663.07	.01	M 27	M 74	3.9	M 4.9	2	M 0	6	5.7	23	36	2.28
10419790717	14063.02	G .00	M 28	M 76	4.0	M 4.7	1	M 0	0	M 4.6	M 20	M 65	1.51
10419790723	19289.25	M .00	M 29	M 78	M 3.9	M 4.5	M 1	M 0	M 0	M 3.6	M 10	M 94	M1.32

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10419790109	996480.38	<.1	.06		3.0	M 3.6	M 1.1	M 2.7	M .7	M .04	M .9	M .00	M .01	M .00
10419790116	1794847.00	<.1	.03		3.1	M 4.1	M 1.7	M 4.3	M .9	M .05	M 1.0	M .00	M .01	M .03
10419790123	1382566.00	<.1	.02		3.3	M 4.9	M 1.7	M 6.6	M 1.3	M .07	M 1.2	M .00	M .01	M .00
10419790130	1120378.00	<.1	.03		3.9	M 5.8	M 2.1	M 8.9	M 1.7	M .10	M 1.4	M .01	M .01	M .00
10419790206	616930.44	<.1	.27		.5	6.8	2.6	11.3	2.2	.14	1.8	.02	.02	.00
10419790213	356090.88	<.1	.03		3.2	M 6.4	M 1.9	M 8.3	M 1.6	M .10	M 1.4	M .01	M .01	M .00
10419790222	350964.13	<.1	.04		1.3	M 6.0	M 1.3	M 5.7	M 1.1	M .06	M 1.0	M .00	M .00	M .00
10419790227	713895.75	<.1	.04		.9	M 5.6	M .5	M 2.2	M .5	M .02	M .6	M .00	M .00	M .00
10419790307	1504735.00	<.1	.00		2.6	5.5	0.2	0.3	0.2	.00	0.4	.00	.00	.00
10419790313	1270164.00	<.1	.03		3.0	M 4.6	M .1	M .2	M .2	M .00	M .3	M .00	M .00	M .00
10419790320	700674.25	<.1	.02		2.1	M 3.9	M .0	M .1	M .2	M .00	M .3	M .00	M .00	M .00
10419790327	431151.50	<.1	.02		3.0	M 3.1	M .0	M .1	M .2	M .00	M .3	M .00	M .00	M .00
10419790405	576411.13	<.1	.02		2.3	2.5	0.0	0.2	0.3	.00	0.3	.00	.00	.00
10419790411	448114.75	<.1	.03		2.6	M 2.9	M .1	M .3	M .3	M .01	M .3	M .00	M .00	M .00
10419790417	634493.69	0.4	.02		1.8	M 3.1	M .2	M .3	M .3	M .01	M .3	M .00	M .00	M .00
10419790424	523366.25	0.6	.03		2.4	M 3.4	M .3	M .4	M .3	M .02	M .4	M .00	M .00	M .00
10419790501	483969.19	0.8	.04		2.2	3.8	0.5	0.6	0.5	.04	0.6	.02	.00	.00
10419790509	360482.69	<.1	.02		2.6	M 3.7	M .4	M .5	M .5	M .03	M .6	M .02	M .00	M .00
10419790516	298377.94	<.1	.04		2.3	M 3.6	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790522	641554.69	<.1	.06		2.0	M 3.5	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790529	661021.75	<.1	.02		0.3	M 3.4	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790606	372663.88	<.1	.02		.9	M 3.3	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790612	204249.81	<.1	.00		3.0	M 3.2	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790619	118744.44	<.1	.04		0.6	M 3.1	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790626	57797.07	0.2	.05		4.0	M 3.1	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790703	50466.70	<.1	.02		2.2	M 3.1	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790710	31663.07	0.4	.07		3.2	M 3.1	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790717	14063.02	<.1	M .06		.9	M 3.1	M .4	M .5	M .5	M .02	M .6	M .02	M .00	M .00
10419790723	19289.25	M .1	M .05		M 1.4	M 3.1	M .4	M .5	M .5	M .02	M .7	M .02	M .00	M .00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10619760714	239676.25	.06	26	170	3.5	12.0	<25	0	9	2.1	0	110	2.44
10619760721	5198.15	M .03	M 26	M 152	M 3.6	M10.8	M 25	M 0	M 14	M 9.0	M 0	M 44[illegible]	M2.24
10619760727	1070.45	.00	27	135	3.9	9.6	<25	0	19	16.0	0	770	2.04
10619760803	1101.59	C .04	24	150	6.0	M 7.1	<25	0	32	M10.3	M 64	M1199	5.74
10619760810	87246.06	.09	32	140	5.6	4.3	M 25	0	14	3.8	140	1700	3.61
10619760817	10361.78	.04	M 28	M 130	6.3	M 3.1	M 25	M 0	11	M 4.1	M 70	M1580	2.49
10619760824	549.45	.01	25	120	6.8	2.0	M 25	0	64	4.6	1	1400	2.41
10619760831	65.73	.00	24	160	6.9	M 2.2	M 25	0	M 99	M 4.8	M 0	M1773	2.63
10619760907	0.00	M .31	28	180	M 6.8	2.5	M 25	0	135	M 5.0	M 0	M2146	M1.99
10619760916	367.47	C .64	23	130	6.7	M 4.1	<25	0	2	M 5.3	M 0	M2519	1.37
10619760922	2186.82	.03	28	90	6.6	6.2	25	0	2	5.7	0	3000	2.72
10619760928	137.42	.02	23	155	6.5	M 6.0	<25	0	19	M 4.3	M 50	M4250	2.13
10619761005	43414.14	.02	18	175	6.2	6.0	M 32	0	2	2.9	100	8500	1.68
10619761012	1556.89	.02	M 16	M 137	6.0	M 6.9	M 41	M 0	2	M 4.1	M 113	M6499	2.13
10619761019	297.32	.02	14	100	5.5	M 7.8	50	0	69	M 5.3	M 126	M7499	1.68
10619761026	35703.21	.00	22	130	5.1	8.7	35	0	97	6.6	140	8500	1.65
10619761102	4902.42	.07	6	105	5.9	M 7.3	<25	1	M 67	M 4.3	M 78	M4305	3.47
10619761109	1556.88	C .03	4	95	6.1	6.0	<25	0	M 37	2.0	0	110	1.62
10619761115	459.19	C .14	5	90	5.5	M 6.4	<25	0	8	M 2.2	M 0	M 406	1.62
10619761122	36628.60	C .02	6	110	5.4	6.8	27	0	10	2.4	0	660	1.71
10619761130	11403.34	.10	M 10	M 66	4.9	M 7.3	<25	M 0	6	M 2.8	M 34	M1425	1.96
10619761207	7252.35	4.44	16	60	5.8	8.0	<25	0	12	3.3	73	2300	6.72
10619761214	50792.73	.08	4	125	4.8	M 7.0	<25	0	5	M 2.4	M 56	M2758	1.57
10619761220	96554.50	.16	10	110	M 4.6	6.0	<25	0	M 4	1.6	M 39	M3216	1.74
10619761229	60550.21	C .16	7	100	4.6	M 6.4	<25	0	4	M 1.5	M 25	M3609	1.37
10619770105	6226.82	C .04	7	65	5.6	7.2	<25	0	3	1.5	5	4200	1.40

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619760714	239676.25	.6	.13	76	6.3	M 5.6	M 1.5	M 7.9	M 2.1	M .00	M 1.8	M .00	M .01	M .00
10619760721	5198.15	M .3	M .12	M 83	M 6.8	M 6.7	M 2.0	M13.8	M 2.4	M .00	M 1.6	M .00	M .01	M .00
10619760727	1070.45	<.1	.12	93	7.4	M 7.9	M 2.5	M19.2	M 2.8	M .00	M 1.7	M .00	M .01	M .00
10619760803	1101.59	<.1	1.0	174	15.1	9.0	3.0	24.1	3.2	.00	1.8	.00	.02	.00
10619760810	87246.06	<.1	.28	116	12.7	M 8.5	M 2.8	M23.2	M 3.1	M .00	M 1.5	M .00	M .01	M .00
10619760817	10361.78	<.1	.94	36	10.3	M 8.0	M 2.6	M22.3	M 3.0	M .00	M 1.3	M .00	M .00	M .00
10619760824	549.45	<.1	.35	81	11.2	M 7.5	M 2.4	M21.4	M 3.0	M .00	M 1.0	M .00	M .00	M .00
10619760831	65.73	<.1	.26	84	M12.1	M 7.0	M 2.2	M20.5	M 3.0	M .00	M .8	M .00	M .00	M .00
10619760907	0.00	M .1	M .48	M 91	M13.1	M 6.5	M 2.0	M19.6	M 3.0	M .00	M .6	M .00	M .00	M .00
10619760916	367.47	.3	.71	99	14.2	6.0	2.0	18.9	3.0	.00	0.5	.00	.00	.00
10619760922	2186.82	<.1	.25	118	13.9	M 6.2	M 1.5	M20.8	M 3.2	M .00	M .7	M .01	M .00	M .00
10619760928	137.42	<.1	.13	72	12.8	M 6.3	M 1.2	M22.0	M 3.4	M .00	M .8	M .02	M .00	M .00
10619761005	43414.14	<.1	.48	86	16.1	6.5	1.0	23.4	3.6	.00	1.1	.04	.00	.00
10619761012	1556.89	.1	.28	94	15.9	M 6.5	M 1.3	M23.2	M 3.6	M .00	M 1.0	M .03	M .00	M .00
10619761019	297.32	<.1	.19	76	14.6	M 6.5	M 1.6	M23.0	M 3.6	M .00	M .9	M .01	M .00	M .00
10619761026	35703.21	<.1	2.05	84	23.8	M 6.5	M 2.0	M22.9	M 3.6	M .00	M .8	M .00	M .01	M .00
10619761102	4902.42	<.1	.89	70	22.0	6.5	2.5	22.8	3.8	.01	.8	.00	.02	.00
10619761109	1556.88	<.1	.25	53	19.1	M 6.4	M 2.8	M22.7	M 3.9	M .00	M .7	M .01	M .02	M .00
10619761115	459.19	<.1	.46	42	15.2	M 6.3	M 3.0	M22.6	M 4.0	M .00	M .6	M .01	M .02	M .00
10619761122	36628.60	<.1	.77	60	20.8	M 6.2	M 3.2	M22.5	M 4.1	M .00	M .5	M .02	M .03	M .00
10619761130	11403.34	.2	.71	59	20.6	M 6.1	M 3.5	M22.4	M 4.3	M .00	M .5	M .03	M .04	M .00
10619761207	7252.35	3.3	1.62	44	24.3	6.0	4.0	22.4	4.6	.00	0.6	.05	.06	.00
10619761214	50792.73	<.1	3.23	64	23.8	M 5.8	M 3.5	M21.0	M 4.2	M .00	M 1.0	M .04	M .04	M .00
10619761220	96554.50	<.1	5.36	48	18.3	M 5.7	M 3.0	M19.6	M 3.8	M .00	M 1.4	M .63	M .02	M .00
10619761229	60550.21	<.1	.54	62	18.2	M 5.6	M 2.5	M18.4	M 3.5	M .00	M 1.8	M .02	M .01	M .00
10619770105	6226.82	<.1	.93	50	14.8	5.5	2.0	16.8	3.2	.00	2.1	.03	.00	.00

Appendix D (Cont'd)

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ST. DATE     FLOW VOLUME   NO3-N    T C   COND    PH    D.O    TURB   SAL    F.S    BOD  COL-F  COL-T    TKN
10619770113     87589.13  C .11      0      90   5.5  M 6.1    <25      1      6  M 1.8  M   4  M3572   1.62
10619770119      7535.44  C .00      0     110   5.4    5.0    <25      0     11  M 2.1  M   2  M2854   1.68
10619770127     10111.77  M .00      3      70   5.9    5.1    <25      0      7  M 2.3  M   1  M2316   0.78
10619770131      2116.56  C .00      2      70   5.6   11.0     27      0     14    2.8      1   1600   1.20
10619770207       891.60    .00      1      90   5.9    4.2  M 108      0  M  34  M 2.8     49   1400   1.06
10619770216      5713.75  M .06  M   1  M   90 M 5.4  M 5.5  M 251  M   0  M  69  M 2.9  M  34  M1125  M2.69
10619770224      7031.09    .16      1      90   4.8    7.3    435      0  M 115  M 3.1  M  16  M 772   4.80
10619770302     13273.39    .16      7      80   5.3    3.0    200      1    156    3.4      0    460   4.28
10619770310     71075.00    .25  M  10  M  101   5.0  M 4.8     55  M   0     17  M 4.2  M  72  M 318   1.82
10619770317    105914.19    .13     15     130   5.2    7.4    250      0    442    5.4    170    130   1.46
10619770323     17084.18  M .06  M  19  M  124   5.1  M 8.0     70  M   0     47  M 6.3  M 150  M 133   1.74
10619770401     14133.65    .00     23     120   5.4    8.6    100      0    184  M 7.0  M 134  M 135   1.68
10619770406      5618.79    .06     16     100   5.3    9.6    180      0     90    8.3    110    140   2.10
10619770414      2767.76    .11  M  19  M  111   5.6  M 9.0    250  M   0    629  M 7.9  M  98  M 170   0.98
10619770420       208.96    .07  M  23  M  129 M 5.2  M 8.1  M 204  M   0  M 310  M 7.4  M  59  M 219   3.84
10619770427       570.31    .03  M  27  M  143   5.0  M 7.4    170  M   0     71  M 7.0  M  36  M 256   3.22
10619770504      6169.24    .04     32     160   5.2    6.8    120      0     79    6.7     11    300  S3.17
10619770511     85969.56    .02  M  31  M  152   4.8  M 6.5     55  M   0     28  M 7.4  M  53  M 255   3.36
10619770519      9979.57    .03     30     145   5.5    6.4     84      0    100    8.3     95    210   1.81
10619770526     90893.06    .04  M  31  M  150   4.5  M 6.5     43  M   4     31  M 5.6  M  95  M1751   2.60
10619770601     14530.64    .02     32     155   5.7    6.6     63      8  M 168    3.3     96   3100   3.36
10619770607      5637.20    .00  M  27  M  135   5.8  M 6.6    850  M   4    286  M 4.5  M  77  M1735   2.03
10619770614      3497.68    .00     23     115   6.0    6.8     36      0     88    5.9     59    370   1.90
10619770621      2530.56    .00  M  24  M  146   6.0  M 6.9     62  M   0     62  M 8.9  M 134  M 666   2.52
10619770629       896.25    .00  M  25  M  178   5.8  M 7.1     37  M   0     42   12.0    210  M 963   3.64
10619770706      8426.00    .00  M  27  M  214   5.5  M 7.3     20  M   0     54  M10.9  M  99  M1302   2.10
10619770713     29738.96    .00     29     247   5.7    7.6      2      0    103  M 9.9      3   1600   4.62
10619770721       755.34    .00  M  29  M  247   5.5  M 7.0  M   3  M   0     18  M 8.9  M  22  M1999   3.36
10619770726         0.00  M .10  M  29  M  247 M 5.4  M 6.4  M   4  M   0  M  16  M 7.8  M  44  M2436  M3.11
10619770802         0.00  M .16  M  29  M  247 M 5.3  M 6.0  M   5  M   0  M  18  M 7.1  M  58  M2742  M2.96
10619770810         0.00  M .25  M  30  M  248 M 5.2  M 5.5  M   6  M   0  M  13  M 6.2  M  77  M3142  M2.75
10619770817      2586.53    .37     32     250   5.2    8.0      8      1     12    5.3    100   3600   2.52
10619770822     97545.13    .00     30     193   5.0   10.5      5      1      6    4.9   3300   1400   1.68
10619770830      3131.89    .07  M  29  M  191   4.8  M 9.4      3  M   0     71  M 5.4  M2475  M1051   1.96
10619770906        31.75    .17  M  27  M  185   4.5  M 7.6  M   6  M   0  M  58  M 6.4  M1155  M 494   2.10
10619770913    260760.19    .05     27     180   5.1    6.2     10      0     42    7.3      0      7   1.96
10619770920      6072.59    .10     30     150   5.7    5.5      7      0    106    4.3    140  M 604   2.24
10619770927      2047.24    .00  M  26  M  132   5.1  M 6.4      6  M   0     42  M 8.1  M 375  M1202   2.24
10619771004       340.49    .00     23     115   5.5    7.4     12      0     31   12.0    610   1000   2.07
10619771011        10.89    .34  M  20  M  119   5.1  M 8.0     15  M   0    152  M 6.0  M 341  M1100   2.38
10619771018    104521.19    .02     17     123   5.1    8.7     68      0      5    <.1     73    860   1.51
10619771025      4176.36    .10  M  20  M  131   5.9  M 8.0    140  M   0     18  M 1.5  M  66  M 365   1.18
10619771103    260017.50    .06     24     140   5.0    7.4      4      0      3    3.1     60    170   1.96
10619771108    162510.94    .20  M  15  M  120   5.5  M 7.5      1  M   0      7  M 2.1  M  58  M 214   2.07
10619771115    105098.13    .19     10     110   5.5    7.6      5      0     11    1.6     87    240   2.38
10619771122      7813.38    .45  M  12  M  102   5.8  M11.5      6  M   0     17  M 4.1  M  42  M 250   2.27
10619771129      6120.67    .52     14      95   6.0   15.5     76      0     17    6.8     27    260   1.40
10619771206      9643.55  C .05  M   9  M   87   5.6  M13.6      6  M   0     14  M 5.0  M  34  M 390   1.48
10619771212     10613.81  C .07      5      80   5.6   11.8      5      0     19    3.3     41    820   1.60
10619771220     14535.61  C .28  M   5  M   80   5.5  M10.4      8  M   0     12  M 2.9  M  44  M 420   1.79
10619771230     48685.20    .25  M   5  M   80   5.6  M 8.6     11  M   0      2  M 2.4  M  47  M 286   1.68
10619780105    142272.50    .26      7      80   5.4    6.5      4      0      9    2.0     53    120   1.48
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Appendix D (Cont'd)

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MC	CU	FE	MN	ZN	CD
10619770113	87589.13	<.1	2.96	61	15.4	M 5.3	M 2.0	M16.3	M 2.9	M .00	M 2.0	M .02	M .00	M .00
10619770119	7535.44	<.1	1.17	65	18.8	M 5.0	M 2.0	M15.8	M 2.5	M .00	M 1.6	M .01	M .00	M .00
10619770127	10111.77	<.1	.77	53	14.0	M 4.8	M 2.0	M15.4	M 2.3	M .00	M 1.3	M .01	M .00	M .00
10619770131	2116.56	<.1	.77	55	16.5	M 4.6	M 2.1	M14.9	M 2.0	M .00	M 1.0	M .01	M .00	M .00
10619770207	891.60	<.1	.64	57	15.1	4.6	2.3	14.8	1.9	.00	0.9	.02	.00	.00
10619770216	5713.75	M .2	M .62	M 92	M14.6	M 5.0	M 2.9	M13.5	M 2.1	M .00	M 2.7	M .01	M .00	M .00
10619770224	7031.09	.4	.61	138	14.1	M 5.6	M 3.8	M11.8	M 2.3	M .00	M 5.1	M .01	M .01	M .00
10619770302	13273.39	.2	.64	112	12.7	6.3	4.7	10.4	2.6	.00	7.3	.01	.03	.00
10619770310	71075.00	.1	1.66	57	14.2	M 6.9	M 4.8	M10.0	M 2.5	M .00	M 6.9	M .01	M .02	M .00
10619770317	105914.19	<.1	3.10	64	11.6	M 7.7	M 4.9	M 9.5	M 2.4	M .00	M 6.4	M .01	M .01	M .00
10619770323	17084.18	<.1	2.52	M 61	13.6	M 8.4	M 5.0	M 9.1	M 2.3	M .00	M 6.0	M .01	M .00	M .00
10619770401	14133.65	<.1	1.00	M 58	13.8	M 9.0	M 5.1	M 8.8	M 2.2	M .00	M 5.6	M .01	M .00	M .00
10619770406	5618.79	<.1	.61	55	13.0	M10.0	M 5.3	M 8.3	M 2.0	M .00	M 5.1	M .01	M .00	M .00
10619770414	2767.76	.1	.52	90	14.7	M10.5	M 5.4	M 8.0	M 1.9	M .00	M 4.8	M .01	M .00	M .00
10619770420	208.96	.1	1.04	133	15.5	M11.4	M 5.5	M 7.6	M 1.8	M .00	M 4.4	M .01	M .00	M .00
10619770427	370.31	.1	.64	135	17.6	M12.1	M 5.6	M 7.4	M 1.8	M .00	M 4.1	M .01	M .00	M .00
10619770504	6169.24	<.1	.52	124	17.7	13.0	5.9	7.2	1.8	.00	3.9	.02	.00	.00
10619770511	65969.56	.1	.58	112	19.3	M13.0	M 5.1	M 9.0	M 1.9	M .00	M 4.1	M .01	M .04	M .00
10619770519	9979.57	.1	1.06	93	15.0	M13.0	M 4.3	M10.9	M 2.0	M .00	M 4.3	M .01	M .08	M .00
10619770526	90893.06	<.1	2.41	91	9.4	M13.0	M 3.4	M13.0	M 2.2	M .00	M 4.6	M .01	M .13	M .00
10619770601	14530.64	.4	2.22	92	11.8	13.0	2.7	15.0	2.5	.00	4.9	.02	.19	.00
10619770607	5637.20	.2	.65	97	12.6	M13.1	M 3.3	M18.7	M 2.8	M .00	M 4.1	M .01	M .16	M .00
10619770614	3497.68	<.1	.31	107	14.0	M13.2	M 3.9	M22.4	M 3.1	M .00	M 3.4	M .00	M .13	M .00
10619770621	2530.56	<.1	.42	119	13.4	M13.4	M 4.6	M26.7	M 3.5	M .00	M 2.6	M .00	M .10	M .00
10619770629	896.25	.1	.33	108	39.3	M13.6	M 5.4	M31.0	M 3.9	M .00	M 1.8	M .00	M .07	M .00
10619770706	8426.00	<.1	2.64	101	38.9	14.0	6.4	36.0	4.5	.02	.9	.00	.05	.00
10619770713	29738.96	<.1	3.90	124	31.7	M13.4	M 5.8	M34.2	M 4.3	M .01	M .8	M .00	M .04	M .00
10619770721	755.34	.1	3.46	112	33.7	M12.8	M 5.2	M32.4	M 4.1	M .00	M .7	M .00	M .03	M .50
10619770726	0.00	M .1	M2.80	M 94	M31.3	M12.1	M 4.6	M30.4	M 3.9	M .00	M .6	M .00	M .02	M .00
10619770802	0.00	M .1	M2.39	M 83	M29.8	M11.7	M 4.2	M29.1	M 3.7	M .00	M .6	M .00	M .02	M .09
10619770810	0.00	M .1	M1.81	M 67	M27.8	M11.1	M 3.6	M27.4	M 3.5	M .00	M .6	M .00	M .02	M .00
10619770817	2686.53	.3	1.16	60	25.6	M10.5	M 3.0	M25.4	M 3.3	M .00	M .6	M .00	M .02	M .00
10619770822	97545.13	<.1	.82	57	28.0	M10.0	M 2.5	M23.7	M 3.1	M .00	M .6	M .00	M .02	M .00
10619770830	3131.89	.1	.70	64	22.7	M 9.6	M 2.1	M22.5	M 3.0	M .00	M .6	M .00	M .02	M .00
10619770906	31.75	<.1	.71	42	23.3	9.1	1.7	20.7	3.0	.00	.7	.00	.03	.00
10619770913	260760.19	<.1	1.6	62	17.7	7.0	0.6	16.3	2.4	.03	.5	.02	.02	.00
10619770920	6072.59	<.1	.76	76	21.1	M 7.8	M .5	M16.6	M 2.4	M .01	M .5	M .01	M .01	M .00
10619770927	2047.24	<.1	.76	82	19.2	M 8.6	M .5	M16.9	M 2.4	M .00	M .6	M .00	M .00	M .00
10619771004	340.49	<.1	.92	86	17.9	9.5	0.5	17.4	2.5	.00	.8	.00	.00	.00
10619771011	10.89	<.1	1.02	82	18.0	M 8.6	M .3	M16.8	M 2.4	M .00	M .7	M .00	M .02	M .00
10619771018	104521.19	<.1	.30	54	21.9	M 7.7	M .1	M16.1	M 2.3	M .00	M .6	M .00	M .04	M .00
10619771025	4176.36	<.1	.20	57	20.6	M 6.9	M .0	M15.5	M 2.2	M .01	M .6	M .01	M .06	M .00
10619771103	260017.50	<.1	1.18	52	18.0	6.1	0.0	15.0	2.2	.02	.7	.02	.09	.00
10619771108	162510.94	<.1	3.39	56	16.2	M 4.2	M .0	M10.2	M 1.5	M .02	M .5	M .01	M .06	M .00
10619771115	105098.13	.3	4.75	56	12.9	M 3.1	M .0	M 7.5	M 1.1	M .02	M .3	M .00	M .04	M .00
10619771122	7813.38	.2	2.54	59	13.1	M 1.7	M .0	M 3.9	M .5	M .03	M .1	M .00	M .03	M .00
10619771129	6120.67	.1	0.26	60	17.2	0.4	0.0	0.3	0.1	.05	0.1	.00	.02	.00
10619771206	9643.55	<.1	.30	49	17.4	7.3	0.2	14.0	2.6	.01	0.8	.01	.02	.00
10619771212	10613.01	<.1	.15	54	17.5	M 7.6	M .1	M14.1	M 2.6	M .00	M .8	M .01	M .01	M .00
10619771220	14535.61	<.1	.23	58	16.2	M 7.8	M .0	M14.1	M 2.6	M .00	M .8	M .01	M .01	M .00
10619771230	40685.20	<.1	.36	70	19.0	M 8.2	M .0	M14.2	M 2.6	M .00	M .9	M .02	M .01	M .00
10619780105	142272.50	<.1	0.32	56	15.7	8.8	0.0	14.5	2.8	.00	1.2	.04	.01	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10619780110	13188.98	.03	M 8	M 80	5.6	M 7.3	11	M 0	36	M 2.0	M 84	M2072	0.20
10619780117	134842.38	.65	10	80	5.1	8.0	14	0	25	2.1	110	3700	0.81
10619780124	267016.38	.68	M 8	M 72	5.4	M 6.9	12	M 0	28	M 2.0	M 56	M3500	0.95
10619780131	92256.81	.37	6	65	5.8	5.8	6	0	4	2.1	3	3300	2.07
10619780207	10848.96	.16	M 5	M 62	5.5	M 6.6	7	M 0	37	M 2.3	M 25	M6649	2.32
10619780216	15820.55	.06	4	60	5.5	7.6	34	0	104	2.6	48	9999	1.23
10619780224	14446.71	.08	M 5	M 62	5.6	M 8.4	5	M 0	80	M 3.4	M 25	M5446	1.29
10619780228	8491.08	.21	7	65	5.6	9.2	9	0	31	4.3	6	1400	1.46
10619780308	68265.19	.64	M 10	M 71	3.9	M 8.8	12	M 0	12	M 4.1	M 6	M1016	0.73
10619780314	78908.88	1.14	19	85	5.2	8.2	26	0	56	4.8	9	250	1.62
10619780321	29181.61	.01	M 21	M 96	5.5	M 8.1	20	M 0	96	M 5.6	M 17	M 185	1.65
10619780329	33952.90	.52	24	110	5.3	8.1	8	0	14	G 7.6	27	110	2.02
10619780405	16610.19	.02	M 21	M 120	5.3	M 7.8	140	M 0	958	M 6.6	M 44	M 469	10.58
10619780412	10125.99	M .02	M 19	M 130	M 5.6	M 7.6	M 150	M 0	M 570	M 5.0	M 60	M 784	M4.01
10619780419	22091.47	.04	18	140	6.0	M 7.4	160	0	182	5.1	76	1100	7.45
10619780425	17787.97	.61	M 17	M 135	6.8	M 7.2	110	M 0	154	M 5.6	M 157	M 815	2.74
10619780427	51875.05	1.11	M 17	M 131	5.9	M 7.0	31	M 0	48	M 6.0	M 226	M 571	18.92
10619780502	114707.38	1.12	17	130	6.1	7.0	64	0	49	6.2	259	493	2.02
10619780510	107950.19	.17	M 17	M 137	5.7	M 7.4	41	M 0	33	M 6.4	M 153	M 390	4.70
10619780516	100737.13	.13	18	150	6.1	8.3	94	0	60	6.9	0	230	2.21
10619780522	12951.69	.44	M 24	M 150	6.7	M 5.6	90	M 0	47	M 6.1	M 6	M 210	2.66
10619780529	1486.09	.67	30	150	6.5	3.0	78	0	122	5.5	13	190	3.36
10619780606	40368.91	.05	M 26	M 140	5.9	M 5.0	76	M 0	114	M 6.8	M 12	M 297	2.27
10619780614	7326.56	.58	23	139	6.3	7.4	620	0	30	6.6	11	420	7.20
10619780620	1040.70	.06	M 24	M 141	6.4	M 7.6	43	M 0	28	M 9.6	M 11	M 574	2.58
10619780628	46.41	.83	25	150	6.1	7.8	64	0	106	12.0	12	690	4.17
10619780705	1027.36	.08	M 24	M 132	5.9	M 6.0	56	M 0	66	M 8.1	M 38	M 354	3.47
10619780712	290.55	M .09	24	155	5.8	4.5	62	0	160	4.7	100	60	M3.25
10619780718	608.07	M .10	M 29	M 152	5.9	M 5.9	40	M 0	61	M 4.8	M 326	M 194	M3.04
10619780725	133.81	M .11	34	150	M 6.0	7.2	M 40	0	M 168	5.0	520	310	M2.86
10619780801	9835.43	.14	M 32	M 139	6.2	M 7.1	42	M 0	294	M 4.9	M 509	M 474	12.66
10619780808	329.09	.01	M 30	M 151	6.7	M 7.0	7	M 0	32	M 4.8	M 498	M 638	5.71
10619780814	0.00	M .02	M 28	M 152	M 6.6	M 6.9	M 9	M 0	M 31	M 4.7	M 487	M 802	M5.42
10619780823	0.00	M .03	M 27	M 152	M 6.5	M 6.8	M 11	M 0	M 30	M 4.6	M 477	M 943	M5.17
10619780829	0.00	M .05	M 25	M 153	M 6.3	M 6.7	M 14	M 0	M 28	M 4.5	M 462	M1154	M4.80
10619780905	0.00	M .06	M 24	M 153	M 6.2	M 6.6	M 16	M 0	M 27	M 4.4	M 452	M1295	M4.55
10619780912	0.00	M .07	M 23	M 154	M 6.1	M 6.5	M 18	M 0	M 26	M 4.3	M 441	M1459	M4.26
10619780919	0.00	M .09	M 22	M 155	M 6.0	M 6.5	M 20	M 0	M 25	M 4.2	M 430	M1623	M3.97
10619780926	0.00	M .11	M 21	M 156	M 5.9	M 6.5	M 22	M 0	M 24	M 4.1	M 419	M1787	M3.69
10619781003	0.00	M .13	M 20	M 157	M 5.8	M 6.5	M 25	M 0	M 23	M 4.0	M 408	M1951	M3.41
10619781010	0.00	M .15	M 19	M 158	M 5.7	M 6.5	M 28	M 0	M 22	M 3.9	M 397	M2115	M3.13
10619781017	0.00	M .17	M 18	M 159	M 5.6	M 6.5	M 31	M 0	M 21	M 3.8	M 386	M2279	M2.85
10619781025	0.00	M .19	M 17	M 160	M 5.5	M 6.5	M 34	M 0	M 20	M 3.7	M 375	M2444	M2.57
10619781031	0.00	M .21	M 15	M 161	M 5.4	M 6.5	M 37	M 0	M 19	M 3.6	M 362	M2632	M2.25
10619781109	0.00	M .22	M 14	M 162	M 5.3	M 6.5	M 39	M 0	M 18	M 3.5	M 352	M2773	M2.01
10619781114	0.00	M .25	M 12	M 164	M 5.2	M 6.5	M 43	M 0	M 17	M 3.4	M 338	M2905	M1.65
10619781121	0.00	M .26	M 11	M 165	M 5.1	M 6.5	M 45	M 0	M 16	M 3.4	M 330	M3103	M1.45
10619781128	0.00	M .29	M 10	M 166	M 5.1	M 6.5	M 49	M 0	M 16	M 3.4	M 320	M3268	M1.17
10619781205	8151.54	.32	M 10	M 168	5.2	M 6.5	53	M 0	16	M 3.4	M 310	M3434	.90
10619781213	3236.64	.11	10	170	5.0	M 6.5	175	0	708	3.4	300	3600	5.88
10619781219	5175.24	.12	M 7	M 121	5.0	M 6.5	120	M 0	842	M 4.6	M 128	M5657	8.96
10619781228	72849.44	.20	5	85	5.0	6.5	100	0	910	5.6	0	7200	5.74
10619790104	69886.13	.18	M 7	M 82	4.9	M 7.2	160	M 0	170	M 4.4	M 0	M7593	1.09

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619780110	13180.98	<.1	0.46	62	13.7	M 8.9	M .0	M14.7	M 2.8	M .00	M 1.3	M .03	M .01	M .00
10619780117	134842.38	M .4	1.02	52	8.8	M 8.9	M .0	M14.9	M 2.8	M .00	M 1.4	M .02	M .01	M .00
10619780124	267016.38	1.0	1.60	35	5.2	M 9.0	M .0	M15.2	M 2.8	M .00	M 1.5	M .01	M .01	M .00
10619780131	92256.81	M .8	1.98	M 47	7.8	M 9.1	M .0	M15.5	M 2.8	M .00	M 1.7	M .01	M .01	M .00
10619780207	10848.96	0.6	1.05	60	13.5	9.4	0.0	16.0	2.8	.01	2.0	.02	.03	.00
10619780216	15820.55	0.3	0.46	39	11.5	M 8.2	M .8	M14.9	M 2.6	M .01	M 1.7	M .02	M .02	M .00
10619780224	14446.71	0.1	0.35	34	11.5	M 6.7	M 1.9	M13.4	M 2.4	M .02	M 1.4	M .02	M .02	M .00
10619780228	8491.08	0.2	0.34	34	10.8	M 5.4	M 3.0	M12.1	M 2.2	M .03	M 1.1	M .02	M .02	M .00
10619780308	68265.19	0.3	0.49	43	11.1	4.8	3.6	11.6	2.2	.05	1.0	.03	.03	.00
10619780314	78908.88	0.4	0.76	35	10.8	M 5.9	M 3.4	M12.9	M 2.5	M .04	M 3.4	M .03	M .04	M .00
10619780321	29181.61	<.1	0.57	57	10.0	M 6.7	M 3.2	M13.8	M 2.8	M .03	M 5.2	M .03	M .04	M .00
10619780329	33952.90	0.4	0.70	91	10.4	M 7.6	M 3.1	M15.0	M 3.1	M .02	M 7.4	M .03	M .05	M .00
10619780405	16610.19	0.4	0.72	313	11.6	8.8	3.0	16.4	3.6	.02	10.0	.04	.07	.00
10619780412	10125.99	M .7	M .77	M 243	M11.9	M 8.3	M 2.4	M17.7	M 3.4	M .01	M 9.7	M .03	M .05	M .00
10619780419	22091.47	1.2	0.82	174	12.2	M 7.8	M 1.8	M19.0	M 3.2	M .01	M 9.5	M .02	M .04	M .00
10619780425	17787.97	0.1	0.29	74	10.7	M 7.4	M 1.3	M20.3	M 3.0	M .01	M 9.3	M .01	M .03	M .00
10619780427	51875.05	<.1	2.27	M 53	5.6	M 7.0	M .9	M21.4	M 2.8	M .01	M 9.1	M .01	M .02	M .00
10619780502	114707.38	<.1	0.30	47	6.7	7.0	0.8	21.8	2.8	.02	M 9.0	.02	.02	.00
10619780510	107950.19	<.1	0.80	48	8.2	M 7.1	M .8	M22.1	M 2.8	M .01	M 8.8	M .02	M .02	M .00
10619780516	100737.13	<.1	0.27	73	9.2	M 7.3	M .8	M22.7	M 2.9	M .01	M 8.6	M .02	M .02	M .00
10619780522	12951.69	<.1	0.39	84	10.3	M 7.4	M .8	M23.1	M 3.0	M .01	M 8.4	M .02	M .02	M .00
10619780529	1486.09	<.1	0.41	105	11.9	M 7.5	M .8	M23.6	M 3.1	M .01	M 8.3	M .02	M .02	M .00
10619780606	40368.91	<.1	0.46	174	8.7	7.8	1.0	24.2	3.4	.02	8.2	.03	.03	.00
10619780614	7326.56	<.1	0.88	243	10.2	M 8.0	M .7	M23.3	M 3.2	M .01	M 7.0	M .02	M .04	M .00
10619780620	1040.70	0.3	0.27	116	13.4	M 8.2	M .4	M22.4	M 3.1	M .01	M 5.8	M .02	M .05	M .00
10619780628	46.41	<.1	1.85	148	13.5	M 8.4	M .2	M21.8	M 3.0	M .01	M 4.9	M .02	M .06	M .00
10619780705	1027.36	0.5	0.88	M 125	21.2	8.8	0.0	21.0	3.0	.02	3.8	.03	.08	.00
10619780712	290.55	M .4	M .93	M 105	M19.5	M 9.2	M .2	M23.3	M 3.4	M .01	M 5.7	M .04	M .07	M .00
10619780718	608.07	M .3	M .98	M 86	M17.8	M 9.6	M .4	M25.6	M 3.8	M .01	M 7.7	M .06	M .06	M .00
10619780725	133.81	M .2	M1.03	M 69	M16.4	M10.0	M .6	M27.6	M 4.2	M .01	M 9.4	M .07	M .05	M .00
10619780801	9835.43	0.2	1.10	M 50	14.9	10.5	1.0	30.1	4.8	.02	11.5	.10	.05	.00
10619780808	329.09	1.2	0.17	32	13.8	M10.4	M 1.0	M29.3	M 4.7	M .01	M10.9	M .09	M .05	M .00
10619780814	0.00	M 1.1	M .19		M14.1	M10.3	M 1.0	M28.5	M 4.6	M .00	M10.3	M .08	M .05	M .00
10619780823	0.00	M 1.0	M .20		M14.3	M10.2	M 1.0	M27.9	M 4.5	M .00	M 9.8	M .07	M .05	M .00
10619780829	0.00	M .9	M .22		M14.7	M10.1	M 1.0	M27.0	M 4.4	M .00	M 9.0	M .06	M .05	M .00
10619780905	0.00	M .9	M .24		M15.0	M10.0	M 1.0	M26.4	M 4.3	M .00	M 8.5	M .05	M .05	M .00
10619780912	0.00	M .9	M .26		M15.3	M 9.9	M 1.0	M25.7	M 4.2	M .00	M 7.9	M .04	M .05	M .00
10619780919	0.00	M .9	M .28		M15.6	M 9.8	M 1.0	M25.0	M 4.1	M .00	M 7.3	M .04	M .05	M .00
10619780926	0.00	M .9	M .30		M15.9	M 9.7	M 1.0	M24.3	M 4.0	M .00	M 6.7	M .04	M .05	M .00
10619781003	0.00	M .9	M .32		M16.2	M 9.6	M 1.0	M23.6	M 3.9	M .00	M 6.1	M .04	M .05	M .00
10619781010	0.00	M .9	M .34		M16.5	M 9.5	M 1.0	M22.9	M 3.8	M .00	M 5.5	M .04	M .05	M .00
10619781017	0.00	M .9	M .36		M16.8	M 9.4	M 1.0	M22.2	M 3.8	M .00	M 4.9	M .04	M .05	M .00
10619781025	0.00	M .9	M .38		M17.1	M 9.3	M 1.1	M21.5	M 3.8	M .00	M 4.3	M .04	M .05	M .00
10619781031	0.00	M .9	M .41		M17.5	M 9.2	M 1.2	M20.7	M 3.8	M .00	M 3.6	M .04	M .05	M .00
10619781109	0.00	M .9	M .43		M17.8	M 9.1	M 1.3	M20.1	M 3.8	M .00	M 3.1	M .04	M .05	M .00
10619781114	0.00	M .9	M .46		M18.3	M 9.1	M 1.4	M19.2	M 3.8	M .00	M 2.4	M .04	M .05	M .00
10619781121	0.00	M .9	M .48		M18.6	M 9.1	M 1.5	M18.7	M 3.8	M .00	M 2.0	M .04	M .05	M .00
10619781128	0.00	M .9	M .51		M19.0	M 9.1	M 1.6	M18.0	M 3.8	M .00	M 1.5	M .04	M .05	M .00
10619781205	8151.54	.9	0.53		19.6	9.2	1.8	17.4	3.8	.00	1.0	.04	.07	.00
10619781213	3236.64	1.4	0.42		18.3	M 8.8	M 2.7	M16.2	M 3.4	M .00	M 1.5	M .03	M .06	M .00
10619781219	5175.24	1.6	0.55		15.6	M 8.4	M 3.8	M14.8	M 3.0	M .01	M 2.0	M .02	M .05	M .00
10619781228	72849.44	1.1	0.41		14.1	M 8.1	M 4.6	M13.8	M 2.7	M .02	M 2.4	M .01	M .05	M .00
10619790104	69886.13	0.4	0.40		12.3	7.7	6.0	12.3	2.4	.04	3.2	.02	.05	.00

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10619790109	85110.63	.12	10	80	4.8	M 7.8	250	0	234	3.6	M 0	7900	2.77
10619790116	138358.81	.31	M 9	M 80	4.8	M 8.2	243	M 0	281	M 3.3	M 0	M6413	2.27
10619790123	31391.38	.08	9	80	4.9	M 8.8	210	0	366	2.9	M 0	M4332	4.34
10619790130	34009.68	.13	M 6	M 80	5.2	M 9.4	43	M 0	39	M 1.9	M 0	M2251	3.86
10619790206	15847.16	.03	4	80	5.3	10.0	33	M 0	52	1.0	0	170	2.16
10619790213	20292.45	.19	M 6	M 83	5.0	M 9.5	38	M 0	212	M 1.5	M 48	M 212	3.22
10619790222	41601.98	.47	M 8	M 86	4.6	M 9.0	46	M 0	427	M 2.0	M 97	M 254	2.18
10619790227	127725.13	.62	12	90	4.6	8.5	40	0	318	2.7	160	310	4.68
10619790307	51710.60	.00	M 13	M 91	5.0	M 7.8	22	M 0	108	M 3.2	M 98	M 236	1.60
10619790313	63482.71	.00	15	95	5.2	6.9	30	0	88	4.2	0	120	1.48
10619790320	14184.71	.08	M 15	M 97	5.2	M 6.8	28	M 0	480	M 5.3	M 0	M 64	2.60
10619790327	5034.19	.01	15	100	5.0	M 6.8	32	0	302	6.6	0	0	2.18
10619790405	3196.67	.07	M 18	M 124	4.8	M 6.8	36	M 0	356	M 5.9	M 0	M 48	2.86
10619790411	6593.41	.00	23	155	4.9	6.8	22	0	80	5.1	0	110	2.38
10619790417	103146.31	.00	M 23	M 202	5.0	M 6.2	170	M 0	470	M 5.2	M 0	M 140	3.50
10619790424	6298.00	.00	23	250	7.3	M 5.6	660	M 0	1149	5.4	0	170	13.03
10619790501	24542.67	.30	M 24	M 235	6.9	M 5.0	34	M 0	38	M 5.0	M 3	M 220	6.16
10619790508	7578.79	.28	25	220	7.2	M 4.4	30	0	22	4.7	7	270	7.00
10619790516	6152.25	.47	M 23	M 199	6.5	M 3.8	15	M 0	34	M 4.5	M 9	M 218	8.88
10619790522	14335.30	.05	21	175	6.6	3.2	27	0	36	4.4	13	160	2.74
10619790529	16410.01	.21	M 25	M 172	6.6	M 4.1	26	M 0	64	M 8.5	M 28	M 252	3.88
10619790606	7915.32	.06	30	170	6.4	5.2	24	0	84	13.0	40	360	3.58
10619790612	665.26	.02	M 29	M 174	5.9	M 4.9	68	M 0	158	M11.2	M1665	M 484	4.11
10619790619	211.12	M8.83	M 28	M 177	M 3.8	M 4.7	M 63	M 0	M 148	M 9.8	M2084	M 577	M4.03
10619790626	0.00	M9.12	M 27	M 181	M 5.7	M 4.5	M 58	M 0	M 147	M 8.3	M4306	M 683	M3.94
10619790703	0.00	M2.74	M 27	M 185	M 5.6	M 4.3	M 53	M 0	M 146	M 6.8	M3729	M 793	M3.85
10619790710	0.00	M6.36	M 27	M 189	M 5.5	M 4.1	M 48	M 0	M 145	M 5.3	M7152	M 901	M3.77
10619790717	3792.43	G,50	M 27	M 194	5.5	M 3.9	43	M 0	144	M 3.8	M8373	M1010	3.70
10619790723	73236.81	.37	27	200	5.4	3.8	1	0	7	2.3	9999	1120	2.85

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619790109	85110.63	0.4	0.50		8.3	M 8.2	M 4.8	M14.9	M 2.7	M .04	M 3.7	M .03	M .05	M 0
10619790116	138358.81	0.4	.70		6.1	M 8.5	M 3.9	M16.8	M 2.9	M .04	M 4.1	M .04	M .05	M 0
10619790123	31391.38	0.2	.57		8.8	M 9.0	M 2.8	M19.4	M 3.3	M .05	M 4.7	M .05	M .05	M 0
10619790130	34009.68	0.4	.34		11.7	M 9.5	M 1.6	M22.1	M 3.6	M .06	M 5.3	M .06	M .05	M 0
10619790206	15847.16	0.2	.01		13.0	10.2	0.6	24.9	4.1	.08	6.0	.09	.06	.00
10619790213	20292.45	0.2	.17		13.1	M 9.2	M .8	M21.4	M 3.5	M .10	M 5.2	M .07	M .12	M .00
10619790222	41601.98	0.2	.23		12.8	M 8.3	M 1.0	M17.9	M 3.0	M .12	M 4.4	M .05	M .18	M .00
10619790227	127725.13	0.3	.58		11.1	M 7.1	M 1.3	M13.5	M 2.3	M .15	M 3.5	M .03	M .26	M .00
10619790307	51710.60	<.1	.38		9.5	6.5	1.5	11.2	2.0	.17	3.1	.02	.31	.00
10619790313	63482.71	<.1	.41		10.0	M 7.2	M 1.5	M16.9	M 2.3	M .15	M 3.5	M .02	M .26	M .00
10619790320	14184.71	0.2	.35		12.2	M 7.7	M 1.5	M21.2	M 2.5	M .13	M 3.8	M .02	M .22	M .00
10619790327	5034.19	0.1	.36		13.3	M 8.3	M 1.5	M26.2	M 2.8	M .11	M 4.1	M .02	M .18	M .00
10619790405	3196.67	<.1	.36		14.2	M 8.9	M 1.5	M31.2	M 3.1	M .09	M 4.4	M .02	M .14	M .00
10619790411	6593.41	<.1	.23		12.2	M 9.8	M 1.5	M37.7	M 3.6	M .08	M 4.9	M .03	M .10	M .00
10619790417	103146.31	<.1	.46		9.8	M10.4	M 1.5	M42.0	M 3.9	M .07	M 5.2	M .04	M .07	M .00
10619790424	6298.00	<.1	.78		8.7	M11.0	M 1.5	M46.3	M 4.2	M .06	M 5.6	M .05	M .04	M .00
10619790501	24542.67	<.1	.48		10.4	11.8	1.6	51.5	4.7	.06	6.1	.07	.02	.00
10619790508	7578.79	<.1	.33		11.3	M11.7	M 1.5	M48.8	M 4.5	M .05	M 5.7	M .06	M .01	M .00
10619790516	6152.23	<.1	.31		12.2	M11.6	M 1.4	M46.1	M 4.3	M .04	M 5.3	M .05	M .00	M .00
10619790522	14335.30	0.1	.14		11.2	M11.4	M 1.3	M43.0	M 4.1	M .03	M 4.9	M .04	M .00	M .00
10619790529	16410.01	0.3	.19		11.0	M11.3	M 1.2	M40.7	M 3.9	M .02	M 4.6	M .03	M .00	M .00
10619790606	7915.52	0.2	2.12		15.8	M11.2	M 1.1	M38.0	M 3.7	M .01	M 4.3	M .02	M .00	M .00
10619790612	665.26	0.5	1.58		16.7	M11.1	M 1.0	M35.0	M 3.5	M .01	M 3.9	M .01	M .00	M .00
10619790619	211.12	M .4	M1.34		M16.3	M11.0	M .9	M32.7	M 3.3	M .01	M 3.6	M .01	M .00	M .00
10619790626	0.00	M .4	M1.06		M15.9	M10.9	M .8	M30.0	M 3.1	M .01	M 3.3	M .01	M .00	M .00
10619790703	0.00	M .4	M .78		M15.5	M10.8	M .7	M27.4	M 2.9	M .01	M 3.0	M .01	M .00	M .00
10619790710	0.00	M .4	M .51		M15.1	M10.7	M .6	M24.8	M 2.8	M .01	M 2.7	M .01	M .00	M .00
10619790717	3792.43	0.4	.24		14.8	M10.6	M .5	M22.2	M 2.7	M .01	M 2.4	M .01	M .00	M .00
10619790723	73236.81	0.3	.38		16.4	M10.5	M .5	M19.6	M 2.6	M .01	M 2.3	M .01	M .00	M .00

Appendix D (Cont'd)

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CONCENTRATION TABLE
  ST. DATE      FLOW VOLUME    NO3-N      T C     COND       PH      D.O    TURB      SAL      F.S      BOD   COL-F   COL-T     TKN
 10719760714      201789.63      .02       23      100      3.7      3.7     <25        0       10      2.2      20     240    0.94
 10719760721       24429.25   M  .01   M   25   M  110   M  3.8   M  3.9   M  25   M    0   M   19   M  5.2   M  10   M 720   M1.02
 10719760726        1250.25      .00       27      120      4.0      4.2     <25        0       20      8.3       0    1200    1.12
 10719760803          15.04      .00       24       90      4.1   M  4.3     <25        0        5   M  6.5   M  13   M1315    1.12
 10719760810        2557.60      .00       28       95      4.2      4.6   M  25        0        3      3.8      35    1500    1.12
 10719760817        9986.36      .00   M   27   M   97      4.3   M  4.6   M  25   M    0       10   M  3.8   M  17   M1450    1.56
 10719760824          75.58      .00       27      100      4.1      4.7   M  25        0      101      3.8       0    1400    1.15
 10719760831           0.00      .00       26       90      4.2   M  4.9   M  25        0       24   M  3.5   M   0   M1238    2.38
 10719760907           0.00   M  .01   M   25   M   80   M  5.4   M  5.0   M  25   M    0   M   22   M  3.3   M   0   M1076   M2.02
 10719760916           0.00   C  .04       24       70      6.8   M  5.2     <25        0       21   M  3.1   M   1   M 914    1.68
 10719760922           0.00   M  .02   M   21   M   82   M  5.6   M  5.4   M  25   M    0   M   12   M  2.8   M   2   M 706   M1.30
 10719760928           0.00   M  .01   M   19   M   91   M  4.9   M  5.6   M  25   M    0   M    6   M  2.6   M   3   M 568   M1.05
 10719761005       21303.41      .01       18      100      4.2      5.9   M  25        0        1      2.6       4     430    0.81
 10719761012        6967.41      .01   M   16   M   90      4.3   M  6.5   M  25   M    0   M    4   M  2.4   M   2   M 426    2.66
 10719761019           0.00      .03       14       80      4.4   M  7.1     <25        0        7   M  2.3   M   1   M 423    1.01
 10719761026        6100.66      .01       24       80      4.2      7.8     <25        0   M    4      2.3       0     420    0.70
 10719761102        2811.23   C  .05        8       70      4.4   M  9.1     <25        0        1   M  2.4   M   0   M 220    0.90
 10719761109        1373.81      .01        9       55      4.7     10.5     <25        0   M    6      2.7       0      20    0.76
 10719761115           0.00      .01        5       60      4.5   M  8.9     <25        0       11   M  1.8   M   0   M  17    1.06
 10719761122       22661.24      .02        7       70      4.3      7.6     <25        0        4      1.1       0      16    1.37
 10719761130       10577.19      .00   M    9   M   63      4.1   M  8.3     <25   M    0        6   M  1.6   M   0   M  42    1.12
 10719761207       13499.75      .01       12       55      4.0      9.1     <25        0        4      2.2       1      72    0.98
 10719761214       32023.38      .04        7       85      3.9   M  7.1     <25        0        1   M  1.8   M   1   M  44    0.78
 10719761220       79322.81      .06       11      100      3.8      5.2     <25        0        1      1.4       2      17    1.76
 10719761229       60509.70   C  .02        9       90      3.2   M  5.7     <25        0        3   M  1.4   M   1   M  31    1.01
 10719770105       33741.23      .01        9       65      3.4      6.6     <25        0        6      1.4       0      53    0.25
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CONCENTRATION TABLE
  ST. DATE      FLOW VOLUME    NH4-N        P      TOC       CL       NA        K       CA       MG       CU       FE       MN       ZN       CD
 10719760714      201789.63      <.1      .03       55      6.0   M  5.6   M   .1   M  3.4   M  2.4   M  .00   M   .7   M  .01   M  .01   M  .00
 10719760721       24429.25   M   .0   M  .03   M   52   M  6.5   M  5.7   M   .2   M  3.2   M  2.3   M  .00   M   .7   M  .01   M  .02   M  .00
 10719760726        1250.25      <.1      .04       49      7.0   M  5.8   M   .3   M  3.0   M  2.2   M  .01   M   .7   M  .01   M  .03   M  .00
 10719760803          15.04      <.1      .07       56      7.9      6.0      0.5      2.9      2.2      .02      0.8      .02      .05      .00
 10719760810        2557.60      <.1      .11       47      7.0   M  5.5   M   .5   M  2.7   M  2.0   M  .01   M   .8   M  .01   M  .04   M  .00
 10719760817        9986.36      <.1      .06       52      8.2   M  5.0   M   .5   M  2.6   M  1.9   M  .00   M   .8   M  .01   M  .03   M  .00
 10719760824          75.58      <.1      .04       46      7.1   M  4.6   M   .5   M  2.5   M  1.8   M  .00   M   .8   M  .01   M  .02   M  .00
 10719760831           0.00      <.1      .17       58      7.9   M  4.2   M   .5   M  2.4   M  1.7   M  .00   M   .8   M  .01   M  .01   M  .00
 10719760907           0.00   M   .1   M  .10   M   56   M  7.4   M  3.8   M   .5   M  2.3   M  1.6   M  .00   M   .8   M  .01   M  .01   M  .00
 10719760916           0.00       .2      .04       55      7.0      3.5      0.5      2.3      1.6      .00      0.8      .01      .02      .00
 10719760922           0.00   M   .1   M  .02   M   51   M  6.4   M  3.5   M   .5   M  2.8   M  1.9   M  .00   M   .7   M  .01   M  .01   M  .00
 10719760928           0.00   M   .0   M  .01   M   49   M  5.9   M  3.5   M   .5   M  3.2   M  2.1   M  .00   M   .6   M  .01   M  .01   M  .00
 10719761005       21303.41      <.1      .01       47      5.6      3.5      0.5      3.7      2.4      .00      0.6      .03      .02      .00
 10719761012        6967.41      <.1      .04   M   45      7.1   M  3.7   M   .3   M  3.7   M  2.4   M  .00   M   .5   M  .03   M  .01   M  .00
 10719761019           0.00      <.1      .03       43      7.9   M  3.9   M   .1   M  3.7   M  2.4   M  .00   M   .5   M  .04   M  .01   M  .00
 10719761026        6100.66      <.1      .03       48      6.2   M  4.1   M   .0   M  3.8   M  2.5   M  .00   M   .5   M  .05   M  .01   M  .00
 10719761102        2811.23      <.1      .02       36      7.8      4.5      0.0      3.9      2.7      .00      0.6      .07      .01      .00
 10719761109        1373.81      <.1      .02       31      7.8   M  4.5   M   .0   M  3.9   M  2.7   M  .00   M   .6   M  .05   M  .01   M  .00
 10719761115           0.00      <.1      .03       31      7.1   M  4.5   M   .0   M  4.0   M  2.7   M  .00   M   .6   M  .03   M  .01   M  .00
 10719761122       22661.24      <.1      .01       32      8.1   M  4.5   M   .0   M  4.1   M  2.7   M  .00   M   .6   M  .02   M  .01   M  .00
 10719761130       10577.19      <.1      .02       40      8.9   M  4.5   M   .0   M  4.2   M  2.8   M  .00   M   .6   M  .01   M  .01   M  .00
 10719761207       13499.75      <.1      .03       45      9.0      4.5      0.0      4.4      3.0      .00      0.8      .00      .01      .00
 10719761214       32023.38      <.1      .02       38      9.0   M  4.6   M   .0   M  4.3   M  3.0   M  .00   M   .7   M  .00   M  .00   M  .00
 10719761220       79322.81      <.1      .02       48      9.2   M  4.7   M   .0   M  4.2   M  3.0   M  .00   M   .6   M  .00   M  .00   M  .00
 10719761229       60509.70      <.1      .02       52      8.8   M  4.8   M   .0   M  4.1   M  3.0   M  .00   M   .5   M  .00   M  .00   M  .00
 10719770105       33741.23      <.1      .01       50      8.9      5.0      0.0      4.1      3.1      .00      0.5      .01      .00      .00
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NO3-N	T C	COND	PH	D.O	TURB	SAL	F.S	BOD	COL-F	COL-T	TKN
10719770113	65141.45	.00	6	80	3.8	M 5.8	<25	0	6	M 1.2	M 0	M 45	0.22
10719770119	57210.15	M .01	2	110	3.6	5.0	<25	0	4	M 1.0	M 0	M 35	0.98
10719770127	33169.92	.03	5	82	3.8	5.3	<25	0	7	M .9	M 0	M 28	0.78
10719770131	9891.18	.00	2	80	3.9	M 4.6	<25	0	11	.8	0	20	0.78
10719770207	11258.44	.01	3	80	3.6	4.4	<25	0	M 7	M 1.1	0	100	0.92
10719770216	11475.44	.01	4	M 97	3.7	6.0	<25	M 0	2	1.9	0	90	0.48
10719770224	5609.97	.15	3	120	3.7	6.9	<25	0	27	M 1.6	M 2	M 137	0.92
10719770302	27423.21	.01	-02	95	4.1	8.5	<25	0	32	1.4	4	180	1.20
10719770310	55305.60	.01	M 4	M 101	3.7	M 6.7	<25	M 0	1	M 2.5	M 4	M 180	0.70
10719770317	77968.63	.02	14	110	3.6	8.4	<25	0	1	4.2	4	200	1.04
10719770323	30706.59	.00	M 16	M 115	3.7	M 7.0	<25	M 0	4	M 4.6	M 2	M 164	0.76
10719770401	36517.68	.18	18	120	3.7	5.8	<25	0	8	M 4.9	M 1	M 134	1.82
10719770406	7972.69	.08	16	100	3.9	6.8	<25	0	13	5.5	0	89	0.98
10719770414	2587.52	.06	M 17	M 103	M 3.8	M 6.8	M 22	M 0	M 12	M 5.1	M 0	M 82	2.52
10719770420	0.00	M .05	M 19	M 108	M 3.7	M 6.8	M 18	M 0	M 16	M 4.5	M 0	M 72	M2.29
10719770427	0.00	M .04	M 20	M 112	M 3.6	M 6.8	M 15	M 0	M 9	M 4.0	M 0	M 64	M2.12
10719770504	0.00	M .03	M 21	M 117	M 3.6	M 6.8	M 12	M 0	M 8	M 3.5	M 0	M 58	M1.92
10719770511	14857.38	M .02	M 23	M 122	3.7	M 6.9	10	M 0	7	M 3.0	M 0	M 47	M1.72
10719770519	4484.29	.02	M 25	M 127	M 3.6	M 7.0	M 16	M 0	M 7	M 2.5	M 0	M 39	1.53
10719770526	9239.98	.00	M 27	M 133	3.7	M 7.1	<25	M 0	7	M 1.9	M 0	M 29	1.48
10719770601	17541.74	.00	30	140	3.9	7.3	<25	0	5	1.5	0	22	.84
10719770607	2108.92	.00	M 29	M 138	M 3.9	M 7.1	M 25	M 0	M 5	M 1.4	M 2	M 45	1.33
10719770614	0.00	M .02	M 28	M 136	M 3.9	M 6.9	M 25	M 0	M 5	M 1.3	M 4	M 68	M1.40
10719770621	0.00	M .04	M 27	M 134	M 3.9	M 6.7	M 25	M 0	M 5	M 1.2	M 7	M 95	M1.49
10719770629	0.00	M .06	M 26	M 132	M 3.9	M 6.5	M 25	M 0	M 5	M 1.1	M 10	M 122	M1.58
10719770706	0.00	M .09	M 25	M 130	M 3.9	M 6.3	M 25	M 0	M 5	M 1.0	M 13	M 152	M1.68
10719770713	0.00	M .11	M 24	M 128	M 3.9	M 6.2	M 25	M 0	M 5	M .9	M 16	M 179	M1.77
10719770721	0.00	M .13	M 23	M 127	M 3.9	M 6.1	M 25	M 0	M 5	M .8	M 19	M 206	M1.86
10719770726	0.00	M .16	M 22	M 125	M 4.0	M 5.9	M 25	M 0	M 5	M .7	M 22	M 237	M1.96
10719770802	0.00	M .18	M 22	M 124	M 4.0	M 5.8	M 25	M 0	M 5	M .6	M 24	M 256	M2.02
10719770810	0.00	M .21	M 22	M 123	M 4.1	M 5.7	M 25	M 0	M 5	M .5	M 27	M 283	M2.12
10719770817	285.48	.25	M 22	M 122	4.4	M 6.6	M 25	M 0	M 5	M .5	M 30	M 314	2.24
10719770822	7695.27	.00	M 22	M 121	M 4.2	M 5.5	M 25	M 0	M 5	M .5	M 33	M 341	.98
10719770830	0.00	M .00	M 22	M 120	M 4.1	M 5.4	M 25	M 0	M 5	M .5	M 35	M 360	M1.03
10719770906	9087.83	M .00	M 22	M 120	M 3.9	M 5.4	M 25	M 0	M 5	M .5	M 39	M 391	M1.16
10719770913	108743.25	.01	22	120	3.9	5.4	M 25	0	5	0.6	44	420	1.26
10719770920	26196.08	.09	M 19	M 114	3.9	M 5.9	M 25	M 0	M 4	M .5	M 36	M 370	1.26
10719770927	0.00	M .07	M 17	M 108	M 3.9	M 6.4	M 26	M 0	M 3	M .5	M 28	M 320	M1.12
10719771004	0.00	M .05	M 15	M 102	M 3.9	M 6.9	M 27	M 0	M 2	M .5	M 20	M 270	M .98
10719771011	0.00	M .04	M 13	M 96	M 3.9	M 7.4	M 28	M 0	M 1	M .5	M 12	M 220	M .85
10719771018	18530.54	.04	11	91	4.0	8.0	30	0	1	0.5	4	170	0.73
10719771025	5349.82	.10	M 16	M 105	4.1	M 6.2	M 19	M 0	M 15	M 1.1	M 4	M 91	0.64
10719771103	141755.25	.06	21	120	3.7	4.5	8	0	29	1.9	5	13	0.95
10719771108	192008.94	.02	M 12	M 81	3.7	M 7.1	3	M 0	7	M .9	M 6	M 6	1.18
10719771115	167411.06	.15	8	60	5.9	8.6	12	0	50	0.4	8	3	0.92
10719771122	17097.39	.13	M 10	M 70	4.1	M10.8	2	M 0	34	M .9	M 4	M 21	3.22
10719771129	7928.54	.10	13	80	4.2	13.0	36	0	3	1.5	0	40	0.76
10719771206	6351.66	.08	M 8	M 72	4.3	M10.6	3	M 0	14	M 1.4	M 0	M 60	0.84
10719771212	12917.45	.14	4	65	4.1	8.3	2	0	10	1.3	1	80	2.32
10719771220	13019.64	C .12	M 5	M 72	4.2	M 7.6	4	M 0	28	M 1.3	M 0	M 87	0.84
10719771230	71174.88	C .10	M 6	M 82	4.1	M 6.8	4	M 0	14	M 1.4	M 0	M 97	0.78
10719780105	74378.94	.16	8	95	4.1	5.9	13	0	6	1.7	0	110	0.70

Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10719770113	65141.45	<.1	.10	55	9.8	M 5.1	M .4	M 4.0	M 2.7	M .00	M .5	M .02	M .00	M .00
10719770119	57210.15	<.1	.03	38	10.0	M 5.2	M .9	M 4.0	M 2.3	M .00	M .5	M .03	M .00	M .00
10719770127	33169.92	<.1	.01	42	10.6	M 5.3	M 1.3	M 4.0	M 2.0	M .00	M .5	M .03	M .00	M .00
10719770131	9891.18	<.1	.02	43	10.6	M 5.4	M 1.9	M 4.0	M 1.6	M .00	M .5	M .05	M .00	M .00
10719770207	11258.44	<.1	.02	42	11.0	5.5	2.3	4.1	1.5	.00	0.5	.06	.01	.00
10719770216	11475.44	<.1	.18	41	8.9	M 5.3	M 1.6	M 3.9	M 1.4	M .00	M .5	M .04	M .01	M .00
10719770224	5609.97	<.1	.05	38	8.9	M 5.5	M .8	M 3.7	M 1.4	M .00	M .5	M .01	M .01	M .00
10719770302	27423.21	<.1	.03	44	9.1	5.6	0.2	3.6	1.4	.00	0.5	.00	.02	.00
10719770310	55305.60	<.1	.05	40	8.9	M 5.6	M .2	M 3.5	M 1.4	M .00	M .5	M .00	M .01	M .00
10719770317	77968.63	<.1	.11	46	9.2	M 5.7	M .2	M 3.4	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770323	38706.59	<.1	.44	36	9.4	M 5.8	M .2	M 3.3	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770401	36517.68	<.1	.07	M 32	11.5	M 5.9	M .2	M 3.2	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770406	7972.69	<.1	.03	28	9.2	M 6.0	M .3	M 3.1	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770414	2587.52	<.1	.02	54	10.4	M 6.0	M .3	M 3.0	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770420	0.00	M .0	M .02	M 54	M10.2	M 6.1	M .4	M 3.0	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770427	0.00	M .0	M .02	M 54	M10.0	M 6.2	M .5	M 3.0	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770504	0.00	M .0	M .02	M 54	M 9.8	M 6.3	M .6	M 3.0	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770511	14857.38	M .0	.03	M 54	M 9.6	M 6.4	M .7	M 3.0	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770519	4484.29	<.1	.02	55	9.6	M 6.6	M .8	M 3.0	M 1.4	M .00	M .5	M .00	M .00	M .00
10719770526	9239.98	<.1	.04	58	7.5	M 6.8	M 1.0	M 3.0	M 1.4	M .00	M .6	M .00	M .00	M .00
10719770601	17541.74	<.1	.02	60	8.4	7.1	1.2	3.1	1.5	.00	0.7	.00	.00	.00
10719770607	2108.92	<.1	.04	66	9.1	M 7.0	M 1.2	M 3.1	M 1.5	M .00	M .6	M .00	M .00	M .00
10719770614	0.00	M .1	M .03	M 63	M 8.7	M 6.9	M 1.2	M 3.1	M 1.5	M .00	M .5	M .00	M .00	M .00
10719770621	0.00	M .1	M .02	M 59	M 8.3	M 6.7	M 1.2	M 3.2	M 1.5	M .00	M .4	M .00	M .00	M .00
10719770629	0.00	M .1	M .02	M 55	M 7.9	M 6.5	M 1.2	M 3.3	M 1.5	M .00	M .3	M .00	M .00	M .00
10719770706.	0.00	M .2	M .02	M 51	M 7.4	M 6.3	M 1.2	M 3.4	M 1.5	M .00	M .3	M .00	M .00	M .00
10719770713	0.00	M .3	M .02	M 47	M 7.0	M 6.2	M 1.2	M 3.5	M 1.5	M .00	M .3	M .00	M .00	M .00
10719770721	0.00	M .4	M .02	M 44	M 6.6	M 6.1	M 1.2	M 3.6	M 1.5	M .00	M .3	M .00	M .00	M .00
10719770726	0.00	M .5	M .02	M 40	M 6.2	M 6.0	M 1.2	M 3.7	M 1.6	M .00	M .3	M .00	M .00	M .00
10719770802	0.00	M .5	M .02	M 38	M 5.9	M 5.9	M 1.2	M 3.8	M 1.6	M .00	M .3	M .00	M .00	M .00
10719770810	0.00	M .6	M .02	M 35	M 5.6	M 5.8	M 1.2	M 3.9	M 1.7	M .00	M .3	M .00	M .00	M .00
10719770817	285.48	.9	.03	32	5.4	M 5.7	M 1.2	M 4.0	M 1.8	M .00	M .3	M .00	M .00	M .00
10719770822	7695.27	.1	.05	30	6.3	M 5.6	M 1.2	M 4.1	M 1.9	M .00	M .3	M .00	M .00	M .00
10719770830	0.00	M .0	M .04	M 33	M 6.8	M 5.5	M 1.2	M 4.2	M 1.9	M .00	M .3	M .00	M .00	M .00
10719770906	9087.83	M .0	M .02	M 37	M 7.5	M 5.5	M 1.3	M 4.4	M 2.1	M .01	M .3	M .01	M .01	M .00
10719770913	108743.25	<.1	.01	42	8.3	5.5	1.4	4.7	2.3	.02	0.3	.02	.02	.00
10719770920	26196.08	<.1	.03	46	8.4	M 5.4	M 1.1	M 4.6	M 2.0	M .01	M .2	M .01	M .02	M .00
10719770927	0.00	M .0	M .02	M 43	M 8.2	M 5.3	M .9	M 4.5	M 1.8	M .01	M .1	M .01	M .02	M .00
10719771004	0.00	M .0	M .01	M 40	M 8.0	M 5.2	M .7	M 4.4	M 1.6	M .01	M .1	M .01	M .02	M .00
10719771011	0.00	M .0	M .00	M 37	M 7.9	M 5.1	M .5	M 4.3	M 1.4	M .01	M .1	M .01	M .02	M .00
10719771018	18538.54	<.1	.00	35	7.9	M 5.1	M .3	M 4.2	M 1.2	M .01	M .1	M .01	M .02	M .00
10719771025	5349.82	<.1	.01	36	10.6	M 5.1	M .1	M 4.1	M 1.0	M .01	M .1	M .01	M .02	M .00
10719771103	141755.25	<.1	.02	M 41	8.4	5.2	0.0	4.2	0.9	.01	0.2	.01	.04	.00
10719771108	192008.94	<.1	.08	48	6.9	M 8.4	M .0	M 7.8	M 1.5	M .01	M 3.6	M .01	M .05	M .00
10719771115	167411.06	<.1	.07	38	8.6	M10.2	M .0	M 9.8	M 1.8	M .01	M 5.4	M .01	M .06	M .00
10719771122	17097.39	<.1	.03	37	8.5	M12.7	M .0	M12.6	M 2.4	M .01	M 8.0	M .01	M .07	M .00
10719771129	7928.54	<.1	.02	40	8.6	15.3	0.2	15.5	3.0	.03	10.8	.03	.10	.00
10719771206	6351.66	<.1	.01	35	8.7	5.3	0.0	5.0	0.8	.00	0.2	.02	.02	.00
10719771212	12917.45	<.1	.01	56	12.6	M 5.3	M .2	M 5.0	M 1.0	M .00	M .2	M .01	M .01	M .00
10719771220	13019.64	<.1	.02	47	8.8	M 5.3	M .4	M 5.0	M 1.2	M .00	M .3	M .01	M .00	M .00
10719771230	71174.88	<.1	.02	44	8.5	M 5.3	M .7	M 5.0	M 1.5	M .00	M .4	M .01	M .00	M .00
10719780105	74378.94	<.1	.01	45	8.2	5.4	1.2	5.1	2.0	.01	0.6	.02	.00	.00

Appendix D (Cont'd)

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CONCENTRATION TABLE
 ST. DATE       FLOW VOLUME  NO3-N    T C   COND     PH    D.O   TURB    SAL    F.S    BOD  COL-F  COL-T    TKN
10719780110         40301.18  C .00  M  9  M  92     4.1  M 4.8      2  M  0      2  M 2.1  M   0  M  813   1.37
10719780117        111469.81    .02    11      90     4.0    4.0      3     0      4    2.5      0    1400   0.98
10719780124        183101.31    .02  M  9  M  82     3.8  M 5.1      2  M  0      1  M 2.7  M   0  M  785   1.32
10719780131        178781.00    .01  M  7  M  74     4.1  M 6.2      2  M  0      4    3.0      0     170   0.78
10719780207         61863.01    .00  M  5  M  67     4.1  M 7.3      2  M  0      8  M 1.9  M   2  M  195   1.65
10719780216         27732.89    .09     4      60     3.9    8.5      5     0     19    0.8      4     220   0.28
10719780224         40971.42  C .03  M  4  M  62     4.3  M 8.6      8  M  0    103  M 1.0  M   1  M  167   1.12
10719780228         23049.95  C .05     5      65     4.3    8.8      3     0      8    1.3      0     120   0.76
10719780308        109716.50    .06  M  8  M  68     4.0  M 7.8      4  M  0     17  M 1.0  M  14  M  113   1.14
10719780314         95303.06    .36    15      75     4.0    5.9      2     0      2    0.5     43     100   1.98
10719780321         49683.46    .00  M 17  M  81     4.1  M 7.0      3  M  0     19  M 1.9  M  25  M   73   0.76
10719780329         40011.26    .03    21      90     4.2    8.4      2     0      4    3.6      4      43   0.62
10719780405         33075.16    .02  M 19  M  84     4.2  M 7.6      2  M  0      1  M 3.3  M   9  M  110   0.81
10719780412         12874.62    .00  M 18  M  79  M  4.1  M 6.9  M   2  M  0  M   5  M 3.0  M  14  M  170  M .57
10719780419          6994.84    .00    17      75     4.2    6.3      3     0      9    2.9     20     230   0.31
10719780425         41486.13    .00  M 16  M  72     4.2  M 6.4      2  M  0     11  M 2.8  M  11  M  138   0.62
10719780427         65927.69    .04  M 16  M  70     4.0  M 6.5      4  M  0     14  M 2.7  M   3  M   59   0.08
10719780502         73387.00    .00    16      70     4.1    6.6      2     0      3    2.7      1      33   0.70
10719780510        105975.13    .09  M 15  M  81     4.0  M 7.0      2  M  0      2  M 2.6  M   0  M   29   0.93
10719780516         89087.38    .16    14     100     4.1    7.9      8     0     16    2.7      0      24   0.67
10719780522         23304.91    .25  M 15  M  95     4.3  M 7.3     15  M  0    112  M 2.6  M   0  M  125   0.62
10719780529           339.21    .01  M 16  M  90     4.0  M 6.6      2  M  0  M  68  M 2.5  M   0  M  226   0.92
10719780606         26798.36    .08  M 18  M  85     4.2  M 5.9      1  M  0     18  M 2.5  M   0  M  344   0.76
10719780614          6165.58    .10    22      80     4.1    5.2      5  M  0      2    2.5      1     480   0.95
10719780620             0.00    .02  M 21  M  81     4.0  M 5.1      1  M  0      0  M 2.4  M   4  M  473   0.92
10719780628             0.00  M .01  M 20  M  81  M  4.0  M 5.0  M   1  M  0  M   0  M 2.3  M   6  M  468  M .92
10719780705             0.00  M .00  M 19  M  82  M  4.0  M 5.0  M   1  M  0  M   0  M 2.2  M   9  M  461  M .92
10719780712             0.00  M .00  M 18  M  83  M  4.0  M 5.0  M   1  M  0  M   0  M 2.1  M  12  M  455  M .92
10719780718             0.00  M .00  M 17  M  84  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  15  M  449  M .92
10719780725             0.00  M .00  M 16  M  84  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  17  M  444  M .92
10719780801             0.00  M .00  M 15  M  85  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  20  M  438  M .92
10719780808             0.00  M .00  M 14  M  86  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  23  M  432  M .92
10719780814             0.00  M .00  M 13  M  87  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  26  M  426  M .92
10719780823             0.00  M .00  M 12  M  87  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  28  M  421  M .92
10719780829             0.00  M .00  M 11  M  88  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  32  M  414  M .92
10719780905             0.00  M .00  M 10  M  88  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  35  M  409  M .92
10719780912             0.00  M .00  M 10  M  89  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  38  M  403  M .92
10719780919             0.00  M .00  M 10  M  90  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  41  M  397  M .92
10719780926             0.00  M .00  M 10  M  91  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  44  M  391  M .92
10719781003             0.00  M .00  M 10  M  92  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  47  M  385  M .92
10719781010             0.00  M .00  M 10  M  93  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  50  M  379  M .92
10719781017             0.00  M .00  M 10  M  94  M  4.0  M 5.0  M   1  M  0  M   0  M 2.0  M  53  M  374  M .92
10719781025             0.00  M .00  M 10  M  95  M  4.0  M 5.0  M   1  M  0  M   1  M 2.0  M  56  M  369  M .92
10719781031             0.00  M .00  M 10  M  96  M  4.0  M 5.0  M   1  M  0  M   2  M 2.0  M  60  M  363  M .92
10719781109             0.00  M .00  M 10  M  97  M  4.0  M 5.0  M   1  M  0  M   2  M 2.0  M  63  M  358  M .92
10719781114             0.00  M .00  M 10  M  98  M  4.0  M 5.0  M   1  M  0  M   3  M 2.0  M  68  M  351  M .92
10719781121             0.00  M .00  M 10  M  99  M  4.0  M 5.0  M   1  M  0  M   3  M 2.0  M  70  M  347  M .92
10719781128             0.00  M .00  M 10  M 100  M  4.0  M 5.0  M   1  M  0  M   4  M 2.0  M  74  M  342  M .92
10719781205             0.00  M .00  M 10  M 101  M  4.0  M 5.0  M   1  M  0  M   5  M 2.0  M  78  M  337  M .92
10719781213             0.00  M .00  M 10  M 102  M  4.0  M 5.0  M   1  M  0  M   6  M 2.0  M  82  M  332  M .92
10719781219             0.00  M .00  M 10  M 104  M  4.0  M 5.0  M   2  M  0  M   8  M 2.0  M  86  M  326  M .93
10719781228             0.00  M .00  M 10  M 105  M  4.0  M 5.0  M   2  M  0  M   9  M 2.0  M  89  M  322  M .93
10719790104         13068.93    .00  M 10  M 107     4.2  M 5.0      4  M  0     12  M 2.0  M  95  M  316   0.95
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Appendix D (Cont'd)

CONCENTRATION TABLE

ST. DATE	FLOW VOLUME	NH4-N	P	TOC	CL	NA	K	CA	MG	CU	FE	MN	ZN	CD
10719780110	40301.18	<.1	.04	44	8.4	M 6.3	M .9	M 5.7	M 2.2	M .01	M .5	M .01	M .00	M .00
10719780117	111469.81	<.1	.02	52	9.7	M 7.0	M .7	M 6.2	M 2.3	M .01	M .5	M .01	M .00	M .00
10719780124	183101.31	<.1	.02	36	7.4	M 8.1	M .4	M 6.9	M 2.5	M .01	M .5	M .01	M .00	M .00
10719780131	178781.00	<.1	.02	46	7.9	M 9.2	M .1	M 7.7	M 2.8	M .01	M .5	M .01	M .00	M .00
10719780207	61863.01	<.1	.01	73	15.9	10.4	0.0	8.6	3.2	.02	0.6	.02	.01	.00
10719780216	27732.89	<.1	.02	12	1.8	M 8.8	M .5	M 7.6	M 2.8	M .02	M .5	M .02	M .01	M .00
10719780224	40971.42	0.1	.06	26	7.2	M 6.8	M 1.1	M 6.4	M 2.3	M .02	M .5	M .02	M .02	M .00
10719780228	23049.95	<.1	.04	26	6.9	M 5.0	M 1.6	M 5.3	M 1.9	M .03	M .5	M .02	M .03	M .00
10719780308	109716.50	1.4	.15	30	8.7	4.2	2.0	4.8	1.8	.04	0.5	.03	.04	.00
10719780314	95303.06	0.9	.10	40	9.6	M 4.4	M 1.4	M 4.6	M 1.8	M .02	M .4	M .02	M .03	M .00
10719780321	49683.46	<.1	.00	42	6.0	M 4.5	M .9	M 4.5	M 1.8	M .01	M .4	M .01	M .02	M .00
10719780329	40811.26	<.1	.02	40	6.4	M 4.7	M .4	M 4.4	M 1.8	M .00	M .4	M .01	M .02	M .00
10719780405	33075.16	<.1	.00	36	6.2	5.0	0.0	4.4	2.0	.00	0.4	.01	.03	.00
10719780412	12874.62	M .0	M .01	M 34	M 6.1	M 5.0	M .0	M 4.4	M 1.9	M .00	M .4	M .01	M .02	M .00
10719780419	6994.84	<.1	.02	33	6.2	M 5.0	M .0	M 4.4	M 1.9	M .00	M .4	M .01	M .01	M .00
10719780425	41486.13	<.1	.01	34	7.8	M 5.0	M .0	M 4.4	M 1.9	M .00	M .4	M .01	M .01	M .00
10719780427	65927.69	<.1	.02	34	4.6	M 5.0	M .0	M 4.4	M 1.9	M .00	M .4	M .01	M .01	M .00
10719780502	73387.00	<.1	.02	36	5.8	5.0	0.0	4.4	1.9	.00	M .4	.01	.01	.00
10719780510	105975.13	<.1	.02	34	5.9	M 4.9	M .0	M 4.2	M 1.8	M .00	M .4	M .01	M .01	M .00
10719780516	89087.38	<.1	.01	38	7.0	M 4.7	M .0	M 3.9	M 1.7	M .00	M .4	M .01	M .01	M .00
10719780522	23304.91	<.1	.01	37	5.0	M 4.6	M .0	M 3.7	M 1.6	M .00	M .4	M .01	M .01	M .00
10719780529	339.21	<.1	.00	46	6.4	M 4.5	M .0	M 3.5	M 1.5	M .00	M .5	M .01	M .01	M .00
10719780606	26798.36	<.1	.01	45	4.8	4.5	0.0	3.4	1.5	.00	0.7	.01	.02	.00
10719780614	6165.58	<.1	.01	48	6.2	M 4.5	M .0	M 3.4	M 1.5	M .00	M .5	M .01	M .02	M .00
10719780620	0.00	<.1	.09	56	6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .5	M .01	M .02	M .00
10719780628	0.00	M .0	M .08		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780705	0.00	M .0	M .07		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780712	0.00	M .0	M .06		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780718	0.00	M .0	M .05		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780725	0.00	M .0	M .04		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780801	0.00	M .0	M .03		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780808	0.00	M .0	M .02		M 6.9	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780814	0.00	M .0	M .01		M 7.0	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780823	0.00	M .0	M .00		M 7.0	M 4.5	M .0	M 3.4	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780829	0.00	M .0	M .00		M 7.1	M 4.5	M .1	M 3.5	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780905	0.00	M .0	M .00		M 7.1	M 4.5	M .1	M 3.5	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780912	0.00	M .0	M .00		M 7.2	M 4.5	M .2	M 3.6	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780919	0.00	M .0	M .00		M 7.3	M 4.5	M .3	M 3.7	M 1.5	M .00	M .4	M .01	M .02	M .00
10719780926	0.00	M .0	M .00		M 7.4	M 4.5	M .4	M 3.8	M 1.5	M .00	M .4	M .01	M .02	M .00
10719781003	0.00	M .0	M .00		M 7.5	M 4.5	M .5	M 3.9	M 1.5	M .00	M .4	M .01	M .02	M .00
10719781010	0.00	M .0	M .00		M 7.6	M 4.5	M .6	M 4.0	M 1.5	M .00	M .4	M .01	M .02	M .00
10719781017	0.00	M .0	M .00		M 7.7	M 4.6	M .7	M 4.1	M 1.5	M .00	M .4	M .01	M .03	M .00
10719781025	0.00	M .0	M .00		M 7.8	M 4.7	M .8	M 4.2	M 1.5	M .00	M .4	M .01	M .04	M .00
10719781031	0.00	M .0	M .00		M 7.9	M 4.8	M .9	M 4.3	M 1.5	M .00	M .4	M .01	M .05	M .00
10719781109	0.00	M .0	M .00		M 8.0	M 4.8	M 1.0	M 4.3	M 1.5	M .00	M .4	M .01	M .05	M .00
10719781114	0.00	M .0	M .00		M 8.1	M 4.9	M 1.1	M 4.4	M 1.5	M .00	M .4	M .01	M .06	M .00
10719781121	0.00	M .0	M .00		M 8.2	M 4.9	M 1.2	M 4.4	M 1.5	M .00	M .4	M .01	M .06	M .00
10719781128	0.00	M .0	M .00		M 8.3	M 5.0	M 1.3	M 4.5	M 1.5	M .00	M .4	M .01	M .07	M .00
10719781205	0.00	M .0	M .00		M 8.4	M 5.1	M 1.4	M 4.6	M 1.6	M .00	M .4	M .01	M .08	M .00
10719781213	0.00	M .0	M .00		M 8.5	M 5.2	M 1.5	M 4.7	M 1.7	M .00	M .4	M .01	M .09	M .00
10719781219	0.00	M .0	M .00		M 8.7	M 5.4	M 1.7	M 4.9	M 1.8	M .00	M .4	M .01	M .11	M .00
10719781228	0.00	M .0	M .00		M 8.8	M 5.5	M 1.8	M 5.0	M 1.9	M .00	M .4	M .01	M .12	M .00
10719790104	13068.93	<.1	.00		9.1	5.8	2.1	5.3	2.1	.01	0.4	.03	.15	.00

Appendix D (Cont'd)

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CONCENTRATION TABLE
 ST. DATE     FLOW VOLUME     NO3-N     T C     COND       PH      D.O    TURB      SAL       F.S      BOD   COL-F   COL-T     TKN
 10719790109       40033.13     .01      10      110      4.2      5.0       3   M   0         6      2.0     100     313    1.01
 10719790116       87375.13     .03  M   10   M  103      4.0   M  5.4       3   M   0        12   M  1.4  M   30  M  100  M1.28
 10719790123       93995.69     .00      11       95      4.0      6.0       4   M   0         1       .6       0      13    1.68
 10719790130       51437.66     .00  M    8   M   87      4.1   M  7.7       1   M   0         4   M   .5  M    0  M   26     .92
 10719790206       16930.42     .00       6       80      4.6      9.5     220       0        14       .5       0      39    1.20
 10719790213       28315.89     .06  M    7   M   86      4.2   M  8.6       1   M   0        31   M   .7  M    6  M   37    1.06
 10719790222       47330.81     .03  M    8   M   92      3.9   M  7.8       2   M   0        26   M   .9  M   12  M   35    1.31
 10719790227       71932.19     .01      11      100      4.0      6.8       2   M   0        10      1.3      21      33     .90
 10719790307       98029.13     .00  M   12   M   96      4.0   M  6.3       1   M   0         1   M  2.0  M   12  M   20     .87
 10719790313       71649.63     .00      14       90      4.2      5.6       2       0        68      3.3       0       8     .81
 10719790320       26854.69     .00  M   13   M   76      4.1   M  5.3       1   M   0        10   M  2.9  M    7  M   25     .56
 10719790327       12895.88     .05      12       60      4.2      5.0       1       0        13      2.6      16      56     .78
 10719790405        4823.11     .05  M   14   M   81      4.1   M  5.3       2   M   0        48   M  2.3  M    9  M   48     .62
 10719790411        7683.69     .00      18      110      4.2      5.9       1       0        14      2.0       1      39     .76
 10719790417       55116.30     .00  M   18   M  108      4.3   M  5.3       2   M   0        40   M  1.9  M    5  M   45    1.26
 10719790424       15822.64     .00  M   18   M  106   M  4.3      4.8  M    2   M   0   M    31   M  1.8  M    9  M   51    1.15
 10719790501       28874.47     .02  M   18   M  104      4.4   M  4.5       2   M   0        22   M  1.7  M   13  M   58    1.01
 10719790509        4954.68     .00  M   18   M  102   M  4.3   M  4.2  M    1   M   0   M    16   M  1.6  M   18  M   65     .76
 10719790516       30429.65     .04  M   18   M  100      4.2   M  3.8       1   M   0   M    10   M  1.6  M   23  M   74    1.26
 10719790522       60488.99     .00      18      100      4.2      3.6       2       0         6      1.7      29      83     .87
 10719790529       35018.37     .01                       4.2                1                 3                               .91
CONCENTRATION TABLE
 ST. DATE     FLOW VOLUME     NH4-N       P      TOC       CL       NA       K       CA       MG       CU      FE      MN      ZN      CD
 10719790109       40033.13      <.1     .14               9.0   M 6.0   M 1.9   M 5.5   M 2.0   M .02   M  .4   M .02   M .12   M .00
 10719790116       87375.13  M    .1     .02               9.2   M 6.2   M 1.7   M 5.6   M 2.0   M .03   M  .4   M .01   M .10   M .00
 10719790123       93995.69      0.3     .02              10.0   M 6.4   M 1.5   M 5.8   M 2.0   M .05   M  .4   M .01   M .07   M .00
 10719790130       51437.66      <.1     .01               9.6   M 6.7   M 1.4   M 6.0   M 2.0   M .07   M  .4   M .01   M .05   M .00
 10719790206       16930.42      <.1     .39              10.6     7.1     1.3     6.4     2.1     .10    0.4      .02     .04     .00
 10719790213       28315.89      <.1     .01               9.8   M 6.6   M 1.3   M 5.9   M 1.9   M .07   M .40   M .01   M .03   M .00
 10719790222       47330.81      <.1     .01               7.0   M 6.2   M 1.3   M 5.4   M 1.7   M .04   M .40   M .01   M .01   M .00
 10719790227       71932.19      <.1     .02               8.6   M 5.7   M 1.4   M 4.8   M 1.5   M .01   M .40   M .01   M .00   M .00
 10719790307       98029.13      <.1     .01               8.5     5.5     1.5     4.6     1.5     .00    0.4      .01     .00     .00
 10719790313       71649.63      <.1     .02               9.3   M 5.5   M 1.0   M 4.4   M 1.4   M .00   M .34   M .00   M .00   M .00
 10719790320       26854.69      <.1     .00               8.8   M 5.5   M  .7   M 4.2   M 1.3   M .00   M .29   M .00   M .00   M .00
 10719790327       12895.88      <.1     .00               8.7   M 5.5   M  .3   M 4.0   M 1.2   M .00   M .24   M .00   M .00   M .00
 10719790405        4823.11      <.1     .00               8.7     5.5      .0     4.0     1.2     .00    0.2      .00     .00     .00
 10719790411        7683.69      <.1     .02               7.7   M 5.5   M  .4   M 4.4   M 1.1   M .01   M .26   M .00   M .00   M .00
 10719790417       55116.30      0.3     .02               7.6   M 5.5   M  .6   M 4.7   M 1.1   M .02   M .30   M .00   M .00   M .00
 10719790424       15822.64      0.3     .01               7.4   M 5.6   M  .9   M 5.0   M 1.1   M .03   M .34   M .01   M .00   M .00
 10719790501       28874.47      <.1     .02               7.4     5.8     1.3     5.5     1.2     .05    0.4      .03     .00     .00
 10719790509        4934.68      <.1     .01               7.2
 10719790516       30429.65      0.2     .02               7.4
 10719790522       60488.99      <.1     .01               7.6
 10719790529       35018.37      <.1     .02               7.3
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Appendix Table E. Cumulative effluxes by weeks in kg/ha for each element. Elements are accumulated by calendar years. See Appendix Table D for key to table.

Appendix E (Cont'd)

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CUMULATIVE NUTRIENT  MASS TABLE
     DATE        FLOW VOLUME     NO3-N       F.S        BOD      COL-F      COL-T        TKN       NH4-N         P        TOC         CL
[illegible]       [illegible] 0.000E+00 5.998E+00 4.951E-01 4.752E+06 1.901E+09 1.066E-01 9.520E-03 5.712E-03 4.894E+00 5.141E-01
[illegible]       [illegible] 5.657E-04 1.494E+01 8.620E-01 7.062E+06 2.607E+09 1.734E-01 9.520E-03 8.541E-03 7.092E+00 8.592E-01
[illegible]           3315.10 9.748E-04 2.013E+01 1.026E+00 7.804E+06 2.709E+09 1.992E-01 1.157E-02 9.359E-03 8.381E+00 1.000E+00
[illegible]       [illegible] 2.161E-03 2.158E+01 1.120E+00 8.544E+06 2.811E+09 2.374E-01 1.305E-02 1.218E-02 9.315E+00 1.119E+00
[illegible]           8193.24 3.422E-03 2.187E+01 1.262E+00 1.069E+07 3.097E+09 3.080E-01 1.620E-02 1.722E-02 1.146E+01 1.409E+00
[illegible]          16662.34 3.422E-03 2.905E+01 1.582E+00 1.302E+07 3.417E+09 3.760E-01 2.261E-02 2.043E-02 1.441E+01 1.980E+00
[illegible]           3326.66 4.464E-03 2.931E+01 1.657E+00 1.308E+07 3.428E+09 3.946E-01 2.392E-02 2.264E-02 1.531E+01 2.118E+00
[illegible]            502.19 4.561E-03 2.939E+01 1.667E+00 1.310E+07 3.432E+09 3.984E-01 2.411E-02 2.303E-02 1.546E+01 2.142E+00
[illegible]            120.32 4.584E-03 2.964E+01 1.670E+00 1.311E+07 3.433E+09 3.992E-01 2.415E-02 2.308E-02 1.549E+01 2.146E+00
[illegible]           2216.20 5.096E-03 3.001E+01 1.715E+00 1.338E+07 3.459E+09 4.129E-01 2.671E-02 2.342E-02 1.567E+01 2.198E+00
[illegible]           8907.46 6.124E-03 3.022E+01 1.893E+00 1.509E+07 3.599E+09 4.800E-01 5.736E-02 2.891E-02 1.732E+01 2.400E+00
[illegible]           2767.95 6.550E-03 3.049E+01 1.937E+00 1.548E+07 3.662E+09 5.103E-01 5.969E-02 2.935E-02 1.796E+01 2.482E+00
[illegible]           2673.76 6.962E-03 3.076E+01 1.968E+00 1.571E+07 3.742E+09 5.275E-01 6.896E-02 3.058E-02 1.849E+01 2.536E+00
[illegible]           1410.63 7.233E-03 3.095E+01 1.983E+00 1.581E+07 3.771E+09 5.596E-01 7.004E-02 3.101E-02 1.893E+01 2.618E+00
[illegible]            276.12 7.286E-03 3.109E+01 1.986E+00 1.583E+07 3.774E+09 5.615E-01 7.015E-02 3.114E-02 1.899E+01 2.630E+00
[illegible]           6494.55 9.783E-03 3.166E+01 2.059E+00 1.617E+07 3.800E+09 5.985E-01 7.265E-02 3.339E-02 1.986E+01 2.845E+00
[illegible]           4812.33 1.034E-02 3.196E+01 2.102E+00 1.625E+07 3.811E+09 6.168E-01 7.451E-02 3.469E-02 2.044E+01 3.024E+00
[illegible]           4027.82 1.081E-02 3.227E+01 2.131E+00 1.625E+07 3.813E+09 6.307E-01 7.606E-02 3.562E-02 2.083E+01 3.205E+00
[illegible]           2908.38 1.115E-02 3.238E+01 2.158E+00 1.625E+07 3.818E+09 6.404E-01 7.718E-02 3.920E-02 2.122E+01 3.320E+00
[illegible]          15878.97 1.909E-02 3.318E+01 2.335E+00 1.625E+07 3.860E+09 6.936E-01 8.329E-02 4.226E-02 2.220E+01 3.894E+00
[illegible]          14119.60 2.127E-02 3.361E+01 2.482E+00 1.625E+07 3.924E+09 7.241E-01 8.873E-02 4.389E-02 2.312E+01 4.360E+00
[illegible]          14818.32 2.984E-02 3.635E+01 2.625E+00 1.625E+07 4.025E+09 8.041E-01 9.445E-02 5.132E-02 2.510E+01 4.922E+00
[illegible]          21252.69 4.210E-02 3.668E+01 2.709E+00 1.625E+07 4.131E+09 8.523E-01 1.026E-01 5.295E-02 2.755E+01 5.641E+00
[illegible]       [illegible] 4.980E-02 3.745E+01 2.901E+00 1.625E+07 4.236E+09 9.858E-01 1.155E-01 5.937E-02 3.101E+01 6.719E+00
[illegible]       [illegible] 5.375E-02 3.877E+01 3.152E+00 1.625E+07 4.314E+09 1.060E+00 1.286E-01 6.200E-02 3.431E+01 7.720E+00
10119770105       [illegible] 5.442E-02 4.058E+01 3.226E+00 1.625E+07 4.332E+09 1.127E+00 1.353E-01 6.604E-02 3.538E+01 8.097E+00
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CUMULATIVE NUTRIENT  MASS TABLE
     DATE        FLOW VOLUME        NA         K        CA        MG        CU        FE        MN        ZN        CD
[illegible]       [illegible] 7.045E-01 2.095E-01 1.904E-01 1.523E-01 0.000E+00 1.104E+00 1.904E-03 9.520E-04 0.000E+00
[illegible]       [illegible] 1.231E+00 3.396E-01 3.262E-01 2.598E-01 0.000E+00 2.253E+00 2.470E-03 1.518E-03 0.000E+00
[illegible]           3315.10 1.460E+00 3.887E-01 3.835E-01 3.069E-01 0.000E+00 2.846E+00 2.470E-03 1.722E-03 0.000E+00
[illegible]       [illegible] 1.652E+00 4.257E-01 4.309E-01 3.469E-01 0.000E+00 3.387E+00 2.470E-03 2.019E-03 0.000E+00
[illegible]           8193.24 2.024E+00 5.014E-01 5.223E-01 4.225E-01 0.000E+00 4.484E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]          16562.34 2.698E+00 6.488E-01 6.890E-01 5.372E-01 0.000E+00 6.606E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]           3326.60 2.819E+00 6.773E-01 7.190E-01 5.806E-01 0.000E+00 7.016E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]            502.19 2.834E+00 6.816E-01 7.229E-01 5.837E-01 0.000E+00 7.073E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]            120.32 2.838E+00 6.825E-01 7.237E-01 5.844E-01 0.000E+00 7.086E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]           2216.20 2.887E+00 6.996E-01 7.373E-01 5.955E-01 0.000E+00 7.310E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]           8907.76 3.196E+00 7.681E-01 8.093E-01 6.372E-01 0.000E+00 8.140E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]           2767.95 3.315E+00 7.894E-01 8.349E-01 6.806E-01 0.000E+00 8.382E+00 2.470E-03 2.334E-03 0.000E+00
[illegible]           2673.76 3.454E+00 8.100E-01 8.647E-01 7.084E-01 0.000E+00 8.604E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]           1410.63 3.523E+00 8.198E-01 8.810E-01 7.231E-01 0.000E+00 8.705E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]            276.12 3.536E+00 8.215E-01 8.843E-01 7.259E-01 0.000E+00 8.721E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]           6494.55 3.826E+00 8.590E-01 9.643E-01 7.934E-01 0.000E+00 9.051E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]           4812.33 4.031E+00 8.869E-01 1.028E+00 8.474E-01 0.000E+00 9.238E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]           4027.82 4.192E+00 9.101E-01 1.077E+00 8.893E-01 0.000E+00 9.372E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]           2908.38 4.302E+00 9.269E-01 1.111E+00 9.173E-01 0.000E+00 9.453E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]          15878.97 4.864E+00 1.019E+00 1.282E+00 1.064E+00 0.000E+00 9.834E+00 2.470E-03 2.437E-03 0.000E+00
[illegible]          14119.69 5.332E+00 1.100E+00 1.423E+00 1.169E+00 0.000E+00 1.010E+01 2.470E-03 2.437E-03 0.000E+00
[illegible]       [illegible] 5.789E+00 1.165E+00 1.566E+00 1.321E+00 0.000E+00 1.030E+01 2.470E-03 2.437E-03 0.000E+00
[illegible]          21252.69 6.378E+00 1.309E+00 1.763E+00 1.500E+00 0.000E+00 1.054E+01 2.470E-03 2.437E-03 0.000E+00
[illegible]       [illegible] 7.199E+00 1.501E+00 2.058E+00 1.770E+00 0.000E+00 1.083E+01 2.470E-03 2.437E-03 0.000E+00
[illegible]       [illegible] 7.963E+00 1.699E+00 2.347E+00 2.033E+00 0.000E+00 1.107E+01 3.706E-03 2.437E-03 0.000E+00
10119770105       [illegible] 8.299E+00 1.799E+00 2.489E+00 2.161E+00 0.000E+00 1.115E+01 5.894E-03 2.437E-03 0.000E+00
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Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10119770113	31732.50	1.221E-02	1.099E+00	2.076E-01	0.000E+00	3.656E+07	4.396E-02	1.221E-02	3.663E-03	3.663E+00	8.059E-01
10119770119	23738.12	1.221E-02	2.195E+00	4.260E-01	0.000E+00	6.723E+07	1.974E-01	3.961E-02	4.751E-02	6.586E+00	1.738E+00
10119770127	18353.39	1.221E-02	5.020E+00	6.316E-01	0.000E+00	9.287E+07	2.624E-01	4.668E-02	4.892E-02	7.716E+00	2.317E+00
10119770131	9336.82	1.221E-02	6.098E+00	7.646E-01	0.000E+00	1.075E+08	2.753E-01	5.027E-02	5.215E-02	8.650E+00	2.629E+00
10119770207	10251.16	1.260E-02	7.242E+00	8.868E-01	0.000E+00	1.863E+08	2.895E-01	5.421E-02	5.373E-02	9.676E+00	3.071E+00
10119770216	7144.73	1.315E-02	8.039E+00	9.501E-01	0.000E+00	2.262E+08	2.989E-01	5.696E-02	5.593E-02	1.050E+01	3.357E+00
10119770224	7093.92	1.479E-02	1.041E+01	1.005E+00	0.000E+00	2.645E+08	3.207E-01	5.969E-02	5.675E-02	1.126E+01	3.644E+00
10119770302	14388.30	1.867E-02	1.141E+01	1.110E+00	0.000E+00	3.398E+08	3.561E-01	6.523E-02	5.730E-02	1.309E+01	4.131E+00
10119770310	25668.08	2.657E-02	1.269E+01	1.288E+00	0.000E+00	4.989E+08	4.115E-01	7.511E-02	6.125E-02	1.536E+01	4.941E+00
10119770317	32042.73	3.520E-02	2.133E+01	1.510E+00	0.000E+00	7.395E+08	4.879E-01	8.743E-02	6.372E-02	1.845E+01	5.853E+00
10119770323	25619.83	3.914E-02	2.734E+01	1.736E+00	0.000E+00	9.515E+08	5.214E-01	9.729E-02	6.569E-02	2.121E+01	6.514E+00
10119770401	24001.64	3.914E-02	3.242E+01	1.986E+00	0.000E+00	1.166E+09	5.861E-01	1.065E-01	6.939E-02	2.352E+01	7.169E+00
10119770406	7943.86	4.342E-02	3.575E+01	2.090E+00	2.774E+05	1.245E+09	6.289E-01	1.188E-01	7.183E-02	2.474E+01	7.408E+00
10119770413	9746.79	4.680E-02	3.736E+01	2.255E+00	4.475E+05	1.305E+09	7.181E-01	1.600E-01	7.333E-02	2.571E+01	7.727E+00
10119770420	8090.29	4.915E-02	3.944E+01	2.370E+00	4.475E+05	1.308E+09	7.495E-01	1.620E-01	7.490E-02	2.712E+01	7.954E+00
10119770427	5937.84	5.006E-02	4.081E+01	2.494E+00	4.475E+05	1.340E+09	7.865E-01	1.643E-01	7.673E-02	2.886E+01	8.217E+00
10119770504	6809.05	5.111E-02	4.301E+01	2.625E+00	5.664E+05	1.408E+09	8.085E-01	1.669E-01	7.804E-02	3.033E+01	8.476E+00
10119770511	8981.18	5.318E-02	4.436E+01	2.759E+00	5.664E+05	1.539E+09	8.665E-01	1.703E-01	8.115E-02	3.195E+01	8.839E+00
10119770519	6201.47	5.342E-02	4.577E+01	2.826E+00	5.664E+05	1.658E+09	8.997E-01	1.727E-01	8.306E-02	3.338E+01	9.106E+00
10119770526	7059.46	5.668E-02	4.710E+01	2.916E+00	4.185E+07	1.807E+09	9.475E-01	1.754E-01	8.523E-02	3.461E+01	9.334E+00
10119770601	11697.65	6.433E-02	5.615E+01	3.091E+00	1.705E+08	2.072E+09	1.023E+00	1.844E-01	8.748E-02	3.663E+01	9.699E+00
10119770607	4311.07	6.467E-02	5.777E+01	3.169E+00	1.942E+08	2.126E+09	1.045E+00	1.894E-01	8.831E-02	3.761E+01	9.845E+00
10119770614	2518.20	6.467E-02	5.937E+01	3.224E+00	1.942E+08	2.131E+09	1.069E+00	1.904E-01	8.986E-02	3.840E+01	9.980E+00
10119770621	667.62	6.467E-02	5.978E+01	3.246E+00	1.942E+08	2.138E+09	1.077E+00	1.906E-01	9.011E-02	3.866E+01	1.002E+01
10119770629	3900.49	6.497E-02	6.325E+01	3.426E+00	1.944E+08	2.209E+09	1.135E+00	2.011E-01	9.252E-02	4.033E+01	1.023E+01
10119770706	14678.37	9.264E-02	8.087E+01	4.014E+00	1.954E+08	2.614E+09	1.881E+00	7.603E-01	1.100E-01	4.366E+01	1.386E+01
10119770713	3368.45	9.860E-02	8.220E+01	4.130E+00	1.958E+08	2.735E+09	1.928E+00	7.655E-01	1.124E-01	4.476E+01	1.425E+01
10119770721	1114.85	1.023E-01	8.260E+01	4.163E+00	1.961E+08	2.769E+09	1.942E+00	7.659E-01	1.134E-01	4.512E+01	1.437E+01
10119770726	2294.22	1.094E-01	8.393E+01	4.219E+00	1.973E+08	2.824E+09	1.986E+00	7.721E-01	1.153E-01	4.599E+01	1.465E+01
10119770802	754.40	1.117E-01	8.450E+01	4.240E+00	2.009E+08	2.840E+09	2.003E+00	7.756E-01	1.160E-01	4.630E+01	1.475E+01
10119770810	0.00	1.117E-01	8.450E+01	4.240E+00	2.009E+08	2.840E+09	2.003E+00	7.756E-01	1.160E-01	4.630E+01	1.475E+01
10119770817	669.99	1.135E-01	8.537E+01	4.266E+00	2.126E+08	2.848E+09	2.016E+00	7.776E-01	1.163E-01	4.646E+01	1.484E+01
10119770822	35716.48	4.571E-01	9.169E+01	5.200E+00	5.119E+08	4.719E+09	2.959E+00	1.039E+00	1.438E-01	5.333E+01	2.048E+01
10119770830	1946.96	4.834E-01	9.199E+01	5.248E+00	5.343E+08	4.812E+09	2.981E+00	1.042E+00	1.442E-01	5.366E+01	2.084E+01
10119770906	0.00	4.834E-01	9.199E+01	5.248E+00	5.343E+08	4.812E+09	2.981E+00	1.042E+00	1.442E-01	5.366E+01	2.084E+01
10119770913	6282.90	5.893E-01	9.255E+01	5.376E+00	6.659E+08	5.032E+09	3.103E+00	1.095E+00	1.456E-01	5.453E+01	2.170E+01
10119770920	671.76	5.953E-01	9.260E+01	5.389E+00	6.772E+08	5.051E+09	3.114E+00	1.099E+00	1.458E-01	5.464E+01	2.180E+01
10119770927	0.00	5.953E-01	9.260E+01	5.389E+00	6.772E+08	5.051E+09	3.114E+00	1.099E+00	1.458E-01	5.464E+01	2.180E+01
10119771004	0.00	5.953E-01	9.260E+01	5.389E+00	6.772E+08	5.051E+09	3.114E+00	1.099E+00	1.458E-01	5.464E+01	2.180E+01
10119771011	0.00	5.953E-01	9.260E+01	5.389E+00	6.772E+08	5.051E+09	3.114E+00	1.099E+00	1.458E-01	5.464E+01	2.180E+01
10119771018	13917.46	7.227E-01	9.276E+01	5.560E+00	6.792E+08	5.136E+09	3.558E+00	1.115E+00	1.512E-01	5.673E+01	2.419E+01
10119771025	3419.83	7.248E-01	9.469E+01	5.598E+00	6.802E+08	5.164E+09	3.587E+00	1.116E+00	1.521E-01	5.726E+01	2.477E+01
10119771103	51720.07	8.681E-01	9.589E+01	6.136E+00	7.064E+08	5.697E+09	3.821E+00	1.136E+00	1.561E-01	6.482E+01	3.146E+01
10119771108	107313.25	1.116E+00	1.008E+02	8.324E+00	7.476E+08	6.272E+09	4.676E+00	1.219E+00	1.726E-01	8.051E+01	4.290E+01
10119771115	53125.31	1.214E+00	1.152E+02	9.714E+00	7.653E+08	6.411E+09	5.105E+00	1.342E+00	1.991E-01	8.910E+01	4.764E+01
10119771122	2426.28	1.215E+00	1.170E+02	9.763E+00	7.664E+08	6.415E+09	5.127E+00	1.343E+00	2.018E-01	8.964E+01	4.785E+01
10119771129	2820.79	1.217E+00	1.195E+02	9.803E+00	7.680E+08	6.417E+09	5.155E+00	1.348E+00	2.028E-01	9.032E+01	4.810E+01
10119771206	3345.72	1.219E+00	1.209E+02	9.859E+00	7.697E+08	6.425E+09	5.181E+00	1.349E+00	2.046E-01	9.086E+01	4.834E+01
10119771212	3304.26	1.224E+00	1.220E+02	9.924E+00	7.713E+08	6.438E+09	5.249E+00	1.357E+00	2.128E-01	9.221E+01	4.892E+01
10119771220	11568.76	1.252E+00	1.230E+02	1.013E+01	7.757E+08	6.505E+09	5.302E+00	1.361E+00	2.146E-01	9.421E+01	4.978E+01
10119771230	23248.06	1.446E+00	1.237E+02	1.052E+01	7.818E+08	6.700E+09	5.493E+00	1.370E+00	2.182E-01	9.940E+01	5.273E+01
10119780105	33433.70	1.636E+00	1.389E+02	1.101E+01	7.859E+08	7.092E+09	5.719E+00	1.383E+00	2.246E-01	1.045E+02	5.558E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MC	CU	FE	MN	ZN	CD
10119770113	31732.50	8.425E-01	2.320E-01	2.442E-01	2.198E-01	0.000E+00	2.808E-01	2.442E-03	0.000E+00	0.000E+00
10119770119	23738.12	1.683E+00	4.421E-01	4.178E-01	3.751E-01	0.000E+00	6.097E-01	3.355E-03	0.000E+00	0.000E+00
10119770127	18355.39	2.453E+00	6.257E-01	5.449E-01	4.881E-01	0.000E+00	9.275E-01	4.062E-03	0.000E+00	0.000E+00
10119770131	9336.82	2.927E+00	7.371E-01	6.060E-01	5.420E-01	0.000E+00	1.136E+00	4.421E-03	0.000E+00	0.000E+00
10119770207	10251.16	3.495E+00	8.752E-01	6.730E-01	6.011E-01	0.000E+00	1.396E+00	4.815E-03	0.000E+00	0.000E+00
10119770216	7144.73	3.836E+00	9.521E-01	7.198E-01	6.396E-01	0.000E+00	1.558E+00	5.090E-03	0.000E+00	0.000E+00
10119770224	7093.92	4.103E+00	1.004E+00	7.662E-01	6.724E-01	0.000E+00	1.695E+00	5.363E-03	2.730E-04	0.000E+00
10119770302	14388.30	4.524E+00	1.070E+00	8.658E-01	7.388E-01	0.000E+00	1.933E+00	5.917E-03	1.380E-03	0.000E+00
10119770310	25668.08	5.245E+00	1.159E+00	1.034E+00	8.475E-01	0.000E+00	2.348E+00	6.905E-03	2.358E-03	0.000E+00
10119770317	32042.73	6.096E+00	1.233E+00	1.231E+00	9.708E-01	0.000E+00	2.853E+00	8.138E-03	3.601E-03	0.000E+00
10119770323	25619.83	6.737E+00	1.273E+00	1.379E+00	1.059E+00	0.000E+00	3.258E+00	9.124E-03	4.387E-03	0.000E+00
10119770401	24001.64	7.319E+00	1.300E+00	1.517E+00	1.143E+00	0.000E+00	3.645E+00	1.005E-02	6.434E-03	0.000E+00
10119770406	7943.86	7.526E+00	1.313E+00	1.560E+00	1.170E+00	0.000E+00	3.832E+00	1.005E-02	7.045E-03	0.000E+00
10119770413	9746.79	7.793E+00	1.331E+00	1.609E+00	1.204E+00	0.000E+00	4.102E+00	1.005E-02	7.795E-03	0.000E+00
10119770420	5090.29	7.940E+00	1.343E+00	1.632E+00	1.221E+00	0.000E+00	4.272E+00	1.005E-02	8.187E-03	0.000E+00
10119770427	5937.84	8.120E+00	1.361E+00	1.658E+00	1.244E+00	0.000E+00	4.508E+00	1.005E-02	8.872E-03	0.000E+00
10119770504	6809.85	8.340E+00	1.388E+00	1.689E+00	1.276E+00	0.000E+00	4.819E+00	1.005E-02	1.018E-02	0.000E+00
10119770511	8981.18	8.776E+00	1.457E+00	1.727E+00	1.314E+00	0.000E+00	5.207E+00	1.005E-02	1.122E-02	0.000E+00
10119770519	6201.47	9.177E+00	1.528E+00	1.751E+00	1.338E+00	0.000E+00	5.459E+00	1.005E-02	1.170E-02	0.000E+00
10119770526	7059.46	9.763E+00	1.542E+00	1.773E+00	1.362E+00	0.000E+00	5.728E+00	1.032E-02	1.170E-02	0.000E+00
10119770601	11697.65	1.093E+01	1.886E+00	1.809E+00	1.403E+00	0.000E+00	6.151E+00	1.122E-02	1.170E-02	0.000E+00
10119770607	4311.07	1.132E+01	2.020E+00	1.936E+00	1.423E+00	0.000E+00	6.372E+00	1.138E-02	1.170E-02	0.000E+00
10119770614	2515.20	1.153E+01	2.125E+00	2.078E+00	1.437E+00	0.000E+00	6.540E+00	1.148E-02	1.170E-02	0.000E+00
10119770621	667.62	1.158E+01	2.162E+00	2.136E+00	1.442E+00	0.000E+00	6.596E+00	1.151E-02	1.170E-02	0.000E+00
10119770629	3900.49	1.183E+01	2.423E+00	2.598E+00	1.476E+00	0.000E+00	6.995E+00	1.166E-02	1.170E-02	0.000E+00
10119770706	14678.37	1.262E+01	3.620E+00	4.863E+00	1.640E+00	0.000E+00	8.802E+00	1.279E-02	1.283E-02	0.000E+00
10119770713	3368.45	1.280E+01	3.873E+00	5.354E+00	1.680E+00	0.000E+00	9.147E+00	1.305E-02	1.568E-02	0.000E+00
10119770721	1114.85	1.286E+01	3.549E+00	5.508E+00	1.695E+00	0.000E+00	9.239E+00	1.313E-02	1.752E-02	0.000E+00
10119770726	2294.22	1.297E+01	4.090E+00	5.803E+00	1.725E+00	8.828E-05	9.373E+00	1.349E-02	2.344E-02	0.000E+00
10119770802	754.40	1.301E+01	4.133E+00	5.896E+00	1.736E+00	1.463E-04	9.406E+00	1.351E-02	2.585E-02	0.000E+00
10119770810	0.00	1.301E+01	4.133E+00	5.896E+00	1.736E+00	1.463E-04	9.406E+00	1.351E-02	2.585E-02	0.000E+00
10119770817	669.99	1.304E+01	4.164E+00	5.970E+00	1.745E+00	1.721E-04	9.431E+00	1.362E-02	2.763E-02	0.000E+00
10119770822	35716.48	1.460E+01	5.690E+00	9.750E+00	2.199E+00	1.546E-03	1.063E+01	1.911E-02	1.142E-01	0.000E+00
10119770830	1946.96	1.469E+01	5.766E+00	9.948E+00	2.222E+00	1.621E-03	1.069E+01	1.941E-02	1.186E-01	0.000E+00
10119770906	0.00	1.469E+01	5.766E+00	9.948E+00	2.222E+00	1.621E-03	1.069E+01	1.941E-02	1.186E-01	0.000E+00
10119770913	6282.90	1.494E+01	5.952E+00	1.052E+01	2.295E+00	1.863E-03	1.064E+01	2.038E-02	1.294E-01	0.000E+00
10119770920	671.76	1.496E+01	5.969E+00	1.057E+01	2.303E+00	1.889E-03	1.085E+01	2.048E-02	1.304E-01	0.000E+00
10119770927	0.00	1.496E+01	5.969E+00	1.057E+01	2.303E+00	1.889E-03	1.085E+01	2.048E-02	1.304E-01	0.000E+00
10119771004	0.00	1.496E+01	5.969E+00	1.057E+01	2.303E+00	1.889E-03	1.083E+01	2.048E-02	1.304E-01	0.000E+00
10119771011	0.00	1.496E+01	5.969E+00	1.057E+01	2.303E+00	1.889E-03	1.085E+01	2.048E-02	1.304E-01	0.000E+00
10119771018	13917.46	1.544E+01	6.032E+00	1.146E+01	2.436E+00	2.425E-03	1.098E+01	2.263E-02	1.305E-01	0.000E+00
10119771025	3419.83	1.555E+01	6.095E+00	1.166E+01	2.469E+00	2.556E-03	1.100E+01	2.315E-02	1.397E-01	0.000E+00
10119771103	51720.07	1.724E+01	6.095E+00	1.440E+01	2.967E+00	6.536E-03	1.116E+01	3.111E-02	1.476E-01	0.000E+00
10119771108	107313.25	2.075E+01	6.136E+00	1.969E+01	4.040E+00	1.479E-02	1.149E+01	4.350E-02	1.600E-01	0.000E+00
10119771115	53125.31	2.249E+01	6.177E+00	2.218E+01	4.572E+00	1.888E-02	1.165E+01	4.759E-02	1.641E-01	0.000E+00
10119771122	2426.28	2.257E+01	6.180E+00	2.229E+01	4.597E+00	1.907E-02	1.166E+01	4.778E-02	1.642E-01	0.000E+00
10119771129	2820.79	2.266E+01	6.183E+00	2.241E+01	4.629E+00	1.930E-02	1.167E+01	4.810E-02	1.644E-01	0.000E+00
10119771206	3345.72	2.285E+01	6.185E+00	2.258E+01	4.670E+00	1.963E-02	1.180E+01	4.836E-02	1.648E-01	0.000E+00
10119771212	3304.26	2.303E+01	6.185E+00	2.275E+01	4.709E+00	1.976E-02	1.192E+01	4.861E-02	1.652E-01	0.000E+00
10119771220	11568.76	2.362E+01	6.185E+00	2.332E+01	4.843E+00	2.021E-02	1.226E+01	4.950E-02	1.665E-01	0.000E+00
10119771230	23248.06	2.478E+01	6.185E+00	2.442E+01	5.102E+00	2.110E-02	1.279E+01	5.129E-02	1.701E-01	0.000E+00
10119780105	33433.70	2.636E+01	6.185E+00	2.598E+01	5.462E+00	2.367E-02	1.331E+01	5.644E-02	1.778E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10119780110	16908.23	6.896E-02	2.212E+00	2.212E-01	3.542E+06	4.118E+08	1.113E-01	6.506E-03	3.904E-03	2.993E+00	1.470E+00
10119780117	28088.38	1.543E-01	9.562E+00	5.671E-01	1.188E+07	1.393E+09	2.410E-01	2.812E-02	1.255E-02	6.451E+00	2.486E+00
10119780124	272093.75	1.118E+00	1.750E+02	4.650E+00	4.988E+07	2.989E+10	1.707E+00	4.469E-01	9.631E-02	3.053E+01	7.826E+00
10119780131	100582.63	1.408E+00	1.940E+02	6.431E+00	4.988E+07	4.745E+10	2.682E+00	6.017E-01	1.428E-01	4.640E+01	1.050E+01
10119780207	10836.69	1.410E+00	1.959E+02	6.735E+00	4.988E+07	4.893E+10	2.755E+00	6.059E-01	1.444E-01	4.840E+01	1.106E+01
10119780216	13932.39	1.411E+00	2.011E+02	7.271E+00	4.988E+07	5.032E+10	2.843E+00	6.220E-01	1.476E-01	5.033E+01	1.169E+01
10119780224	24654.11	1.498E+00	2.142E+02	8.571E+00	4.988E+07	5.375E+10	3.037E+00	6.410E-01	1.609E-01	5.242E+01	1.288E+01
10119780228	7710.81	1.500E+00	2.174E+02	9.075E+00	5.002E+07	5.510E+10	3.107E+00	6.558E-01	1.627E-01	5.343E+01	1.325E+01
10119780308	38484.63	1.708E+00	2.239E+02	1.091E+01	5.002E+07	5.965E+10	3.352E+00	7.150E-01	1.657E-01	5.669E+01	1.470E+01
10119780314	64768.21	2.047E+00	2.790E+02	1.173E+01	5.002E+07	6.003E+10	3.686E+00	7.898E-01	1.756E-01	6.217E+01	1.669E+01
10119780321	18236.25	2.077E+00	2.830E+02	1.211E+01	5.288E+07	6.017E+10	3.831E+00	8.038E-01	1.805E-01	6.526E+01	1.720E+01
10119780329	27840.48	2.115E+00	2.862E+02	1.297E+01	6.309E+07	6.045E+10	4.131E+00	8.253E-01	1.870E-01	7.265E+01	1.827E+01
10119780405	5041.81	2.118E+00	2.871E+02	1.313E+01	6.802E+07	6.050E+10	4.190E+00	8.350E-01	1.877E-01	7.404E+01	1.849E+01
10119780412	1207.07	2.119E+00	2.874E+02	1.317E+01	6.987E+07	6.051E+10	4.204E+00	8.373E-01	1.880E-01	7.436E+01	1.854E+01
10119780419	608.94	2.119E+00	2.875E+02	1.320E+01	7.115E+07	6.051E+10	4.211E+00	8.387E-01	1.881E-01	7.451E+01	1.857E+01
10119780425	1358.11	2.123E+00	2.878E+02	1.326E+01	7.276E+07	6.052E+10	4.226E+00	8.392E-01	1.886E-01	7.481E+01	1.864E+01
10119780427	14228.02	2.208E+00	2.888E+02	1.404E+01	7.847E+07	6.055E+10	4.301E+00	8.611E-01	1.907E-01	7.673E+01	1.911E+01
10119780502	15247.69	2.210E+00	2.920E+02	1.492E+01	8.087E+07	6.058E+10	4.426E+00	9.139E-01	1.954E-01	7.953E+01	1.975E+01
10119780510	90005.38	2.231E+00	3.024E+02	1.876E+01	8.873E+07	6.166E+10	5.697E+00	9.832E-01	2.093E-01	9.340E+01	2.245E+01
10119780516	75103.31	2.301E+00	3.125E+02	2.023E+01	9.004E+07	6.376E+10	6.304E+00	1.012E+00	2.151E-01	1.032E+02	2.523E+01
10119780522	75103.31	2.353E+00	3.307E+02	2.255E+01	1.064E+08	6.605E+10	7.162E+00	1.099E+00	2.353E-01	1.229E+02	2.797E+01
10119780529	15060.73	2.358E+00	3.361E+02	2.318E+01	1.155E+08	6.655E+10	7.472E+00	1.116E+00	2.440E-01	1.270E+02	2.854E+01
10119780606	154127.13	2.530E+00	4.055E+02	2.878E+01	4.303E+08	7.267E+10	9.696E+00	1.650E+00	3.448E-01	1.757E+02	3.311E+01
10119780614	107954.50	2.584E+00	4.748E+02	3.181E+01	8.450E+08	7.775E+10	1.134E+01	2.190E+00	4.445E-01	2.106E+02	3.510E+01
10119780620	21590.91	2.686E+00	4.845E+02	3.255E+01	8.804E+08	7.826E+10	1.186E+01	2.805E+00	6.564E-01	2.180E+02	3.868E+01
10119780628	1374.14	2.697E+00	4.849E+02	3.261E+01	8.804E+08	7.826E+10	1.191E+01	2.868E+00	6.791E-01	2.185E+02	3.906E+01
10119780705	302.81	2.700E+00	4.849E+02	3.261E+01	9.086E+08	7.827E+10	1.191E+01	2.888E+00	6.829E-01	2.185E+02	3.913E+01
10119780712	16399.79	2.933E+00	4.853E+02	3.295E+01	3.772E+09	7.907E+10	1.236E+01	3.404E+00	8.388E-01	2.209E+02	4.238E+01
10119780718	9321.37	3.020E+00	4.859E+02	3.334E+01	4.525E+09	7.965E+10	1.259E+01	3.640E+00	8.969E-01	2.223E+02	4.388E+01
10119780725	5567.85	3.047E+00	4.863E+02	3.369E+01	4.529E+09	8.006E+10	1.272E+01	3.752E+00	9.160E-01	2.231E+02	4.460E+01
10119780801	4705.88	3.047E+00	4.868E+02	3.399E+01	4.534E+09	8.064E+10	1.282E+01	3.817E+00	9.169E-01	2.238E+02	4.504E+01
10119780808	43484.79	3.316E+00	5.671E+02	3.683E+01	4.602E+09	8.823E+10	1.340E+01	4.068E+00	9.369E-01	2.409E+02	5.190E+01
10119780814	35289.49	3.351E+00	5.689E+02	3.902E+01	4.655E+09	9.407E+10	1.380E+01	4.109E+00	9.519E-01	2.469E+02	5.455E+01
10119780823	52934.24	3.688E+00	5.770E+02	4.213E+01	4.731E+09	1.024E+11	1.416E+01	4.129E+00	9.784E-01	2.554E+02	5.913E+01
10119780829	5881.58	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119780905	3.40	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119780912	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119780919	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119780926	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781003	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781010	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781017	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781025	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781031	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781109	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781114	0.00	3.698E+00	5.788E+02	4.245E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.840E-01	2.574E+02	5.978E+01
10119781121	375.13	3.700E+00	5.793E+02	4.246E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.843E-01	2.574E+02	5.982E+01
10119781128	0.00	3.700E+00	5.793E+02	4.246E+01	4.739E+09	1.033E+11	1.426E+01	4.143E+00	9.843E-01	2.574E+02	5.982E+01
10119781205	8066.82	3.753E+00	5.910E+02	4.254E+01	4.742E+09	1.035E+11	1.431E+01	4.152E+00	9.899E-01	2.574E+02	6.081E+01
10119781213	13983.41	3.833E+00	5.950E+02	4.264E+01	4.747E+09	1.036E+11	1.447E+01	4.158E+00	9.963E-01	2.574E+02	6.266E+01
10119781219	1451.14	3.838E+00	5.955E+02	4.266E+01	4.747E+09	1.037E+11	1.448E+01	4.160E+00	9.967E-01	2.574E+02	6.285E+01
10119781228	60656.94	4.088E+00	6.086E+02	4.347E+01	4.757E+09	1.055E+11	1.493E+01	4.205E+00	1.006E+00	2.574E+02	7.015E+01
10119790104	34818.93	4.298E+00	6.120E+02	4.386E+01	5.077E+09	1.065E+11	1.522E+01	4.218E+00	1.011E+00	2.574E+02	7.428E+01

Appendix E (Cont'd)

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CUMULATIVE NUTRIENT  MASS TABLE
 ST. DATE     FLOW VOLUME        NA         K        CA        MG        CU        FE        MN        ZN        CD
10119780110     16908.23 7.612E-01 0.000E+00 7.027E-01 1.627E-01 6.506E-04 2.602E-01 1.952E-03 3.253E-03 0.000E+00
10119780117     28008.38 1.972E+00 0.000E+00 1.762E+00 4.112E-01 1.731E-03 6.926E-01 4.113E-03 7.576E-03 0.000E+00
10119780124    272093.75 1.307E+01 0.000E+00 1.056E+01 2.505E+00 1.220E-02 4.881E+00 1.458E-02 3.899E-02 0.000E+00
10119780131    100582.63 1.694E+01 0.000E+00 1.327E+01 3.202E+00 1.607E-02 6.429E+00 1.845E-02 4.673E-02 0.000E+00
10119780207     10836.69 1.734E+01 0.000E+00 1.350E+01 3.273E+00 1.691E-02 6.595E+00 1.929E-02 4.756E-02 0.000E+00
10119780216     13932.89 1.785E+01 0.000E+00 1.382E+01 3.364E+00 1.798E-02 6.772E+00 1.982E-02 5.024E-02 0.000E+00
10119780224     24654.11 1.876E+01 0.000E+00 1.444E+01 3.525E+00 1.988E-02 7.000E+00 2.077E-02 5.878E-02 0.000E+00
10119780228      7710.81 1.904E+01 0.000E+00 1.465E+01 3.576E+00 2.047E-02 7.050E+00 2.107E-02 6.234E-02 0.000E+00
10119780308     38484.63 2.050E+01 0.000E+00 1.573E+01 3.842E+00 2.491E-02 7.258E+00 2.403E-02 8.455E-02 0.000E+00
10119780314     64768.21 2.319E+01 7.477E-02 1.732E+01 4.241E+00 2.990E-02 7.831E+00 2.652E-02 1.145E-01 0.000E+00
10119780321     18236.25 2.399E+01 1.099E-01 1.772E+01 4.346E+00 3.060E-02 8.042E+00 2.722E-02 1.215E-01 0.000E+00
10119780329     27840.48 2.532E+01 1.956E-01 1.825E+01 4.496E+00 3.060E-02 8.449E+00 2.830E-02 1.300E-01 0.000E+00
10119780405      5041.81 2.558E+01 2.188E-01 1.833E+01 4.523E+00 3.060E-02 8.542E+00 2.849E-02 1.314E-01 0.000E+00
10119780412      1207.07 2.565E+01 2.230E-01 1.835E+01 4.530E+00 3.060E-02 8.566E+00 2.854E-02 1.318E-01 0.000E+00
10119780419       608.94 2.568E+01 2.244E-01 1.836E+01 4.533E+00 3.060E-02 8.579E+00 2.856E-02 1.320E-01 0.000E+00
10119780425      1358.11 2.576E+01 2.265E-01 1.838E+01 4.540E+00 3.060E-02 8.612E+00 2.866E-02 1.325E-01 0.000E+00
10119780427     14228.02 2.636E+01 2.375E-01 1.866E+01 4.623E+00 3.060E-02 8.973E+00 3.031E-02 1.385E-01 0.000E+00
10119780502     15247.69 2.742E+01 2.492E-01 1.896E+01 4.716E+00 3.118E-02 9.366E+00 3.265E-02 1.436E-01 0.000E+00
10119780510     90005.38 3.255E+01 4.224E-01 2.097E+01 5.271E+00 3.465E-02 1.179E+01 4.304E-02 1.871E-01 0.000E+00
10119780516     75103.31 3.683E+01 7.113E-01 2.296E+01 5.762E+00 3.754E-02 1.399E+01 4.882E-02 2.218E-01 0.000E+00
10119780522     75103.31 4.110E+01 1.116E+00 2.521E+01 6.282E+00 4.043E-02 1.630E+01 5.171E-02 2.565E-01 0.000E+00
10119780529     15060.73 4.196E+01 1.226E+00 2.572E+01 6.392E+00 4.101E-02 1.679E+01 5.229E-02 2.634E-01 0.000E+00
10119780606    154127.13 5.086E+01 2.709E+00 3.153E+01 7.697E+00 5.287E-02 2.219E+01 6.418E-02 3.405E-01 0.000E+00
10119780614    107954.50 5.875E+01 4.578E+00 3.901E+01 8.985E+00 5.702E-02 2.547E+01 7.246E-02 3.862E-01 0.000E+00
10119780620     21590.91 6.066E+01 5.118E+00 4.118E+01 9.317E+00 5.785E-02 2.603E+01 7.495E-02 3.937E-01 0.000E+00
10119780628      1374.14 6.080E+01 5.160E+00 4.135E+01 9.342E+00 5.791E-02 2.606E+01 7.511E-02 3.941E-01 0.000E+00
10119780705       302.81 6.083E+01 5.172E+00 4.140E+01 9.348E+00 5.792E-02 2.606E+01 7.516E-02 3.942E-01 0.000E+00
10119780712     16399.79 6.296E+01 5.923E+00 4.441E+01 9.752E+00 5.855E-02 2.620E+01 7.831E-02 3.980E-01 0.000E+00
10119780718      9321.37 6.430E+01 6.414E+00 4.638E+01 1.001E+01 5.891E-02 2.637E+01 8.047E-02 3.998E-01 0.000E+00
10119780725      5567.85 6.516E+01 6.742E+00 4.769E+01 1.018E+01 5.912E-02 2.640E+01 8.197E-02 4.007E-01 0.000E+00
10119780801      4705.88 6.596E+01 7.054E+00 4.892E+01 1.034E+01 5.930E-02 2.641E+01 8.360E-02 4.014E-01 0.000E+00
10119780808     43484.79 7.304E+01 9.898E+00 5.900E+01 1.178E+01 6.098E-02 2.661E+01 9.690E-02 4.081E-01 0.000E+00
10119780814     35209.49 7.835E+01 1.218E+01 6.840E+01 1.292E+01 6.233E-02 2.686E+01 1.065E-01 4.135E-01 0.000E+00
10119780823     52934.24 8.651E+01 1.558E+01 8.068E+01 1.459E+01 6.437E-02 2.733E+01 1.107E-01 4.216E-01 0.000E+00
10119780829      5881.58 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119780905         3.40 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119780912         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119780919         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119780926         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781003         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781010         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781017         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781025         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781031         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781109         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781114         0.00 8.735E+01 1.595E+01 8.196E+01 1.477E+01 6.460E-02 2.740E+01 1.201E-01 4.226E-01 0.000E+00
10119781121       373.13 8.737E+01 1.598E+01 8.200E+01 1.478E+01 6.461E-02 2.742E+01 1.202E-01 4.226E-01 0.000E+00
10119781128         0.00 8.737E+01 1.598E+01 8.200E+01 1.478E+01 6.461E-02 2.742E+01 1.202E-01 4.226E-01 0.000E+00
10119781205      8066.82 8.781E+01 1.645E+01 8.259E+01 1.497E+01 6.585E-02 2.782E+01 1.223E-01 4.240E-01 0.000E+00
10119781213     13983.41 8.854E+01 1.710E+01 8.360E+01 1.529E+01 6.747E-02 2.841E+01 1.256E-01 4.280E-01 0.000E+00
10119781219      1451.14 8.862E+01 1.715E+01 8.370E+01 1.533E+01 6.750E-02 2.846E+01 1.258E-01 4.283E-01 0.000E+00
10119781228     60656.94 9.170E+01 1.855E+01 8.802E+01 1.666E+01 7.225E-02 3.012E+01 1.375E-01 4.400E-01 0.000E+00
10119790104     34818.93 9.344E+01 1.886E+01 9.050E+01 1.742E+01 7.627E-02 3.075E+01 1.455E-01 4.467E-01 0.000E+00
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Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10119790116	106513.50	3.771E-01	2.541E+01	8.197E-01	1.008E+09	2.501E+09	6.640E-01	1.639E-01	1.639E-02	0.000E+00	8.976E+00
10119790123	106513.50	5.902E-01	5.000E+01	1.312E+00	1.008E+09	3.821E+09	1.410E+00	2.459E-01	6.558E-02	0.000E+00	1.689E+01
10119790130	25488.23	6.431E-01	6.589E+01	1.439E+00	1.008E+09	4.008E+09	1.495E+00	2.655E-01	7.342E-02	0.000E+00	1.870E+01
10119790206	3946.20	6.474E-01	6.631E+01	1.457E+00	1.008E+09	4.015E+09	1.509E+00	2.667E-01	7.389E-02	0.000E+00	1.903E+01
10119790213	4981.96	6.568E-01	7.149E+01	1.491E+00	1.011E+09	4.029E+09	1.538E+00	2.686E-01	7.466E-02	0.000E+00	1.941E+01
10119790222	14150.67	7.183E-01	7.279E+01	1.605E+00	1.027E+09	4.074E+09	1.620E+00	2.795E-01	7.738E-02	0.000E+00	2.047E+01
10119790227	98441.81	1.434E+00	1.012E+02	2.552E+00	1.216E+09	4.452E+09	2.227E+00	3.553E-01	9.253E-02	0.000E+00	2.714E+01
10119790307	28008.63	1.622E+00	1.057E+02	2.876E+00	1.249E+09	4.525E+09	2.446E+00	3.768E-01	9.577E-02	0.000E+00	2.872E+01
10119790313	27607.77	1.714E+00	1.123E+02	3.301E+00	1.251E+09	4.543E+09	2.708E+00	3.874E-01	1.138E-01	0.000E+00	3.034E+01
10119790320	5943.38	1.719E+00	1.142E+02	3.401E+00	1.258E+09	4.554E+09	2.729E+00	3.897E-01	1.145E-01	0.000E+00	3.071E+01
10119790327	5036.45	1.725E+00	1.171E+02	3.498E+00	1.270E+09	4.571E+09	2.771E+00	3.936E-01	1.164E-01	0.000E+00	3.101E+01
10119790405	3853.99	1.735E+00	1.185E+02	3.561E+00	1.276E+09	4.580E+09	2.802E+00	3.951E-01	1.176E-01	0.000E+00	3.123E+01
10119790411	4653.09	1.744E+00	1.195E+02	3.620E+00	1.280E+09	4.587E+09	2.817E+00	3.969E-01	1.187E-01	0.000E+00	3.147E+01
10119790417	7391.20	1.784E+00	1.230E+02	3.731E+00	1.338E+09	4.643E+09	2.850E+00	3.997E-01	1.204E-01	0.000E+00	3.181E+01
10119790424	1263.18	1.786E+00	1.232E+02	3.752E+00	1.338E+09	4.661E+09	2.853E+00	4.002E-01	1.207E-01	0.000E+00	3.187E+01
10119790501	6838.55	1.810E+00	1.266E+02	3.866E+00	1.411E+09	4.792E+09	2.898E+00	4.028E-01	1.228E-01	0.000E+00	3.223E+01
10119790508	1340.55	1.826E+00	1.267E+02	3.887E+00	1.412E+09	4.825E+09	2.957E+00	4.503E-01	1.295E-01	0.000E+00	3.252E+01
10119790516	27439.42	2.186E+00	1.298E+02	4.383E+00	3.656E+09	7.418E+09	3.970E+00	1.158E+00	2.139E-01	0.000E+00	3.737E+01
10119790522	81724.00	3.350E+00	1.449E+02	6.112E+00	1.792E+10	2.168E+10	6.401E+00	2.384E+00	2.926E-01	0.000E+00	4.825E+01
10119790529	28654.84	4.408E+00	1.528E+02	7.149E+00	2.062E+10	2.409E+10	6.818E+00	2.406E+00	3.113E-01	0.000E+00	5.114E+01
10119790606	43896.35	5.371E+00	1.538E+02	9.314E+00	2.063E+10	2.657E+10	7.336E+00	2.423E+00	3.316E-01	0.000E+00	6.063E+01
10119790612	2145.67	5.383E+00	1.540E+02	9.586E+00	2.069E+10	2.664E+10	7.356E+00	2.424E+00	3.326E-01	0.000E+00	6.093E+01
10119790619	589.62	5.385E+00	1.541E+02	9.598E+00	2.072E+10	2.666E+10	7.374E+00	2.424E+00	3.327E-01	0.000E+00	6.102E+01
10119790626	0.00	5.385E+00	1.541E+02	9.598E+00	2.072E+10	2.666E+10	7.374E+00	2.424E+00	3.327E-01	0.000E+00	6.102E+01
10119790703	17017.72	6.016E+00	1.550E+02	9.899E+00	2.241E+10	2.695E+10	8.985E+00	3.341E+00	3.386E-01	0.000E+00	6.281E+01
10119790710	25326.57	6.143E+00	1.571E+02	1.033E+01	2.557E+10	2.724E+10	1.079E+01	4.851E+00	3.464E-01	0.000E+00	6.491E+01
10119790717	0.00	6.143E+00	1.571E+02	1.033E+01	2.557E+10	2.724E+10	1.079E+01	4.851E+00	3.464E-01	0.000E+00	6.491E+01
10119790723	13076.34	6.322E+00	1.591E+02	1.054E+01	2.786E+10	2.726E+10	1.155E+01	5.455E+00	3.544E-01	0.000E+00	6.606E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10119790116	106513.50	5.656E+00	1.023E+00	6.722E+00	2.090E+00	8.197E-03	1.680E+00	2.849E-02	4.918E-02	0.000E+00
10119790123	106513.50	1.148E+01	2.090E+00	1.291E+01	4.017E+00	1.639E-02	3.238E+00	3.689E-02	1.148E-01	0.000E+00
10119790130	25488.23	1.291E+01	2.365E+00	1.427E+01	4.448E+00	1.836E-02	3.571E+00	4.081E-02	1.354E-01	0.000E+00
10119790206	3046.20	1.309E+01	2.400E+00	1.442E+01	4.496E+00	1.871E-02	3.609E+00	4.128E-02	1.385E-01	0.000E+00
10119790213	4981.96	1.334E+01	2.444E+00	1.466E+01	4.567E+00	1.909E-02	3.661E+00	4.185E-02	1.424E-01	0.000E+00
10119790222	14150.67	1.394E+01	2.531E+00	1.529E+01	4.752E+00	1.964E-02	3.783E+00	4.294E-02	1.494E-01	0.000E+00
10119790227	98441.81	1.712E+01	2.834E+00	1.942E+01	5.889E+00	2.342E-02	4.400E+00	5.052E-02	1.646E-01	0.000E+00
10119790307	28008.63	1.787E+01	2.888E+00	2.056E+01	6.190E+00	2.558E-02	4.540E+00	5.375E-02	1.646E-01	0.000E+00
10119790313	27607.77	1.870E+01	3.026E+00	2.165E+01	6.498E+00	2.664E-02	4.833E+00	5.588E-02	1.646E-01	0.000E+00
10119790320	5943.38	1.889E+01	3.070E+00	2.188E+01	6.567E+00	2.664E-02	4.920E+00	5.611E-02	1.646E-01	0.000E+00
10119790327	5036.45	1.907E+01	3.120E+00	2.207E+01	6.629E+00	2.664E-02	5.019E+00	5.630E-02	1.646E-01	0.000E+00
10119790405	3853.99	1.922E+01	3.172E+00	2.222E+01	6.681E+00	2.664E-02	5.114E+00	5.660E-02	1.646E-01	0.000E+00
10119790411	4653.09	1.942E+01	3.226E+00	2.240E+01	6.745E+00	2.664E-02	5.212E+00	5.677E-02	1.646E-01	0.000E+00
10119790417	7391.20	1.975E+01	3.300E+00	2.271E+01	6.851E+00	2.664E-02	5.350E+00	5.706E-02	1.646E-01	0.000E+00
10119790424	1263.18	1.981E+01	3.311E+00	2.276E+01	6.869E+00	2.669E-02	5.370E+00	5.711E-02	1.646E-01	0.000E+00
10119790501	6838.55	2.017E+01	3.363E+00	2.308E+01	6.974E+00	2.748E-02	5.462E+00	5.763E-02	1.651E-01	0.000E+00
10119790508	1340.55	2.024E+01	3.374E+00	2.314E+01	6.996E+00	2.763E-02	5.479E+00	5.774E-02	1.652E-01	0.000E+00
10119790516	27439.42	2.171E+01	3.607E+00	2.449E+01	7.461E+00	3.089E-02	5.811E+00	5.985E-02	1.673E-01	0.000E+00
10119790522	81724.00	2.617E+01	4.330E+00	2.868E+01	8.939E+00	4.024E-02	6.732E+00	6.928E-02	1.736E-01	0.000E+00
10119790529	28654.84	2.776E+01	4.594E+00	3.019E+01	9.479E+00	4.354E-02	7.038E+00	7.259E-02	1.758E-01	0.000E+00
10119790606	43896.35	3.023E+01	5.017E+00	3.257E+01	1.036E+01	4.861E-02	7.475E+00	7.935E-02	1.792E-01	0.000E+00
10119790612	2145.67	3.035E+01	5.038E+00	3.269E+01	1.040E+01	4.886E-02	7.495E+00	7.976E-02	1.794E-01	0.000E+00
10119790619	589.62	3.038E+01	5.044E+00	3.272E+01	1.042E+01	4.893E-02	7.500E+00	7.990E-02	1.795E-01	0.000E+00
10119790626	0.00	3.038E+01	5.044E+00	3.272E+01	1.042E+01	4.893E-02	7.500E+00	7.990E-02	1.795E-01	0.000E+00
10119790703	17017.72	3.141E+01	5.241E+00	3.377E+01	1.083E+01	5.220E-02	7.622E+00	8.513E-02	1.820E-01	0.000E+00
10119790710	25326.57	3.297E+01	5.553E+00	3.538E+01	1.147E+01	5.805E-02	7.786E+00	9.391E-02	1.886E-01	0.000E+00
10119790717	0.00	3.297E+01	5.553E+00	3.538E+01	1.147E+01	5.805E-02	7.786E+00	9.391E-02	1.886E-01	0.000E+0
10119790723	13076.34	3.381E+01	5.734E+00	3.626E+01	1.183E+01	6.207E-02	7.853E+00	9.944E-02	1.927E-01	0.000E+

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10219760714	17651.20	8.150E-03	2.038E+00	1.766E-01	0.000E+00	4.314E+07	1.121E-01	1.358E-02	2.717E-03	2.173E+00	5.298E-01
10219760721	2944.77	9.057E-03	2.627E+00	2.434E-01	0.000E+00	5.960E+07	1.356E-01	1.472E-02	3.510E-03	2.729E+00	6.408E-01
10219760727	313.47	9.129E-03	2.717E+00	2.547E-01	5.473E+03	6.233E+07	1.387E-01	1.484E-02	3.655E-03	2.808E+00	6.552E-01
10219760803	2552.97	9.915E-03	3.572E+00	3.224E-01	1.038E+05	8.787E+07	1.615E-01	1.582E-02	5.030E-03	3.368E+00	7.721E-01
10219760810	7102.25	2.959E-02	3.873E+00	4.372E-01	1.176E+06	1.697E+08	2.871E-01	1.858E-02	8.583E-03	5.117E+00	1.108E+00
10219760817	15600.03	4.280E-02	1.354E+01	7.794E-01	2.265E+06	2.694E+08	3.376E-01	2.456E-02	1.098E-02	6.678E+00	1.576E+00
10219760824	3594.85	4.446E-02	1.383E+01	8.804E-01	2.265E+06	2.740E+08	3.561E-01	2.594E-02	1.209E-02	7.328E+00	1.727E+00
10219760831	413.54	4.449E-02	1.386E+01	8.912E-01	2.287E+06	2.755E+08	3.589E-01	2.610E-02	1.230E-02	7.408E+00	1.747E+00
10219760907	0.00	4.449E-02	1.386E+01	8.912E-01	2.287E+06	2.755E+08	3.589E-01	2.610E-02	1.230E-02	7.408E+00	1.747E+00
10219760916	0.00	4.449E-02	1.386E+01	8.912E-01	2.287E+06	2.755E+08	3.589E-01	2.610E-02	1.230E-02	7.408E+00	1.747E+00
10219760922	3866.18	4.983E-02	1.434E+01	9.683E-01	3.367E+06	3.193E+08	3.827E-01	2.759E-02	1.438E-02	8.271E+00	1.835E+00
10219760928	1297.11	5.074E-02	1.437E+01	9.885E-01	3.593E+06	3.337E+08	3.902E-01	2.958E-02	1.458E-02	8.405E+00	1.864E+00
10219761005	2345.32	5.092E-02	1.442E+01	1.015E+00	3.757E+06	3.591E+08	3.993E-01	3.139E-02	1.503E-02	8.604E+00	1.917E+00
10219761012	965.11	5.100E-02	1.445E+01	1.024E+00	3.808E+06	3.682E+08	4.034E-01	3.176E-02	1.518E-02	8.715E+00	1.944E+00
10219761019	0.00	5.100E-02	1.445E+01	1.024E+00	3.808E+06	3.682E+08	4.034E-01	3.176E-02	1.518E-02	8.715E+00	1.944E+00
10219761026	3114.76	5.148E-02	1.460E+01	1.051E+00	3.862E+06	3.871E+08	4.170E-01	3.296E-02	1.590E-02	9.031E+00	2.033E+00
10219761102	1810.32	5.169E-02	1.474E+01	1.070E+00	3.862E+06	3.927E+08	4.247E-01	3.367E-02	1.632E-02	9.214E+00	2.075E+00
10219761109	1050.40	5.173E-02	1.479E+01	1.083E+00	3.862E+06	3.927E+08	4.272E-01	3.407E-02	1.653E-02	9.278E+00	2.105E+00
10219761115	0.43	5.173E-02	1.479E+01	1.083E+00	3.862E+06	3.927E+08	4.272E-01	3.407E-02	1.653E-02	9.278E+00	2.105E+00
10219761122	7486.97	5.864E-02	1.513E+01	1.144E+00	3.862E+06	3.943E+08	4.457E-01	3.695E-02	1.739E-02	9.653E+00	2.318E+00
10219761130	8057.04	6.050E-02	1.563E+01	1.199E+00	3.862E+06	4.322E+08	4.630E-01	4.005E-02	1.956E-02	1.021E+01	2.641E+00
10219761207	6573.28	6.177E-02	1.601E+01	1.240E+00	2.509E+07	5.061E+08	4.850E-01	4.258E-02	2.184E-02	1.087E+01	2.721E+00
10219761214	36717.20	3.005E-01	1.869E+01	1.452E+00	2.475E+08	1.129E+09	6.235E-01	5.671E-02	2.466E-02	1.412E+01	3.907E+00
10219761220	56598.91	3.441E-01	2.044E+01	1.800E+00	7.515E+08	2.414E+09	8.848E-01	7.849E-02	1.183E-01	2.501E+01	6.891E+00
10219761229	36300.82	5.047E-01	2.141E+01	1.902E+00	9.454E+08	2.921E+09	9.980E-01	9.246E-02	1.225E-01	2.822E+01	8.036E+00
10219770105	32645.82	5.562E-01	2.229E+01	2.120E+00	9.454E+08	2.952E+09	1.090E+00	1.050E-01	1.250E-01	3.161E+01	8.966E+00

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10219760714	17651.28	4.822E-01	7.471E-02	1.426E-01	1.019E-01	0.000E+00	8.150E-01	2.038E-03	2.038E-03	0.000E+00
10219760721	2944.77	5.819E-01	8.604E-02	1.698E-01	1.200E-01	0.000E+00	1.069E+00	2.264E-03	2.264E-03	0.000E+00
10219760727	313.47	5.946E-01	8.725E-02	1.731E-01	1.222E-01	0.000E+00	1.109E+00	2.276E-03	2.276E-03	0.000E+00
10219760803	2552.97	7.125E-01	9.707E-02	2.026E-01	1.418E-01	0.000E+00	1.521E+00	2.375E-03	2.375E-03	0.000E+00
10219760810	7102.25	1.024E+00	1.299E-01	2.955E-01	1.938E-01	0.000E+00	2.521E+00	2.375E-03	2.648E-03	0.000E+00
10219760817	15600.03	1.672E+00	2.139E-01	5.296E-01	3.078E-01	0.000E+00	4.394E+00	2.375E-03	3.248E-03	0.000E+00
10219760824	3594.85	1.813E+00	2.360E-01	5.904E-01	3.341E-01	0.000E+00	4.752E+00	2.375E-03	3.386E-03	0.000E+00
10219760831	413.54	1.829E+00	2.389E-01	5.982E-01	3.371E-01	0.000E+00	4.785E+00	2.375E-03	3.402E-03	0.000E+00
10219760907	0.00	1.829E+00	2.389E-01	5.982E-01	3.371E-01	0.000E+00	4.785E+00	2.375E-03	3.402E-03	0.000E+00
10219760916	0.00	1.829E+00	2.389E-01	5.982E-01	3.371E-01	0.000E+00	4.785E+00	2.375E-03	3.402E-03	0.000E+00
10219760922	3866.18	1.936E+00	2.687E-01	6.622E-01	3.609E-01	0.000E+00	4.923E+00	2.375E-03	3.551E-03	0.000E+00
10219760928	1297.11	1.967E+00	2.771E-01	6.782E-01	3.679E-01	4.991E-05	4.968E+00	2.375E-03	3.601E-03	0.000E+00
10219761005	2345.32	2.017E+00	2.907E-01	6.980E-01	3.805E-01	2.304E-04	5.043E+00	2.375E-03	3.691E-03	0.000E+00
10219761012	965.11	2.037E+00	2.962E-01	7.055E-01	3.857E-01	2.675E-04	5.073E+00	2.375E-03	3.728E-03	0.000E+00
10219761019	0.00	2.037E+00	2.962E-01	7.055E-01	3.857E-01	2.675E-04	5.073E+00	2.375E-03	3.728E-03	0.000E+00
10219761026	3114.76	2.097E+00	3.142E-01	7.270E-01	4.025E-01	3.874E-04	5.146E+00	2.375E-03	3.848E-03	0.000E+00
10219761102	1810.32	2.132E+00	3.248E-01	7.398E-01	4.124E-01	4.582E-04	5.185E+00	2.375E-03	3.919E-03	0.000E+00
10219761109	1050.40	2.152E+00	3.305E-01	7.471E-01	4.181E-01	4.582E-04	5.205E+00	2.375E-03	3.959E-03	0.000E+00
10219761115	0.43	2.152E+00	3.305E-01	7.471E-01	4.181E-01	4.582E-04	5.205E+00	2.375E-03	3.959E-03	0.000E+00
10219761122	7486.97	2.302E+00	3.651E-01	7.969E-01	4.584E-01	4.582E-04	5.324E+00	2.375E-03	4.248E-03	0.000E+00
10219761130	8057.34	2.466E+00	3.992E-01	8.547E-01	5.018E-01	4.582E-04	5.435E+00	2.375E-03	4.558E-03	0.000E+00
10219761207	6573.28	2.605E+00	4.245E-01	9.002E-01	5.372E-01	4.582E-04	5.516E+00	2.627E-03	4.811E-03	0.000E+00
10219761214	36717.20	3.397E+00	5.658E-01	1.155E+00	7.492E-01	4.582E-04	5.940E+00	4.040E-03	4.811E-03	0.000E+00
10219761220	56598.91	4.638E+00	7.835E-01	1.547E+00	1.098E+00	4.582E-04	6.550E+00	6.218E-03	4.811E-03	0.000E+00
10219761229	36300.82	5.448E+00	9.232E-01	1.812E+00	1.349E+00	4.582E-04	6.913E+00	7.615E-03	4.811E-03	0.000E+00
10219770105	32645.82	6.202E+00	1.049E+00	2.076E+00	1.613E+00	4.582E-04	7.214E+00	1.138E-02	4.811E-03	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10219770113	40713.32	6.580E-02	1.097E+00	2.977E-01	1.564E+07	3.128E+07	0.000E+00	1.567E-02	1.567E-03	4.073E+00	1.394E+00
10219770119	41995.57	6.580E-02	2.389E+00	7.663E-01	5.083E+07	5.620E+07	7.757E-02	3.183E-02	3.183E-03	7.931E+00	3.026E+00
10219770126	34146.76	8.025E-02	3.309E+00	1.252E+00	6.573E+07	7.239E+07	1.249E-01	4.496E-02	4.496E-03	1.058E+01	4.183E+00
10219770131	15760.60	8.510E-02	4.583E+00	1.537E+00	6.573E+07	7.780E+07	1.637E-01	5.103E-02	6.316E-03	1.234E+01	4.807E+00
10219770207	13506.93	8.664E-02	5.402E+00	1.727E+00	6.573E+07	8.617E+07	1.821E-01	5.615E-02	7.340E-03	1.377E+01	5.278E+00
10219770216	10397.08	8.904E-02	5.842E+00	1.827E+00	6.573E+07	9.434E+07	2.013E-01	6.015E-02	8.940E-03	1.505E+01	5.706E+00
10219770224	6310.17	9.050E-02	6.936E+00	1.871E+00	6.573E+07	1.930E+08	2.208E-01	6.258E-02	1.040E-02	1.593E+01	5.976E+00
10219770302	17195.57	9.513E-02	9.384E+00	1.950E+00	6.573E+07	1.361E+08	2.538E-01	6.920E-02	1.106E-02	1.804E+01	6.717E+00
10219770310	32620.86	1.165E-01	1.164E+01	2.126E+00	6.573E+07	2.767E+08	3.241E-01	8.175E-02	1.483E-02	2.156E+01	7.872E+00
10219770317	51593.06	1.621E-01	2.554E+01	2.483E+00	6.573E+07	6.641E+08	4.750E-01	1.016E-01	5.056E-02	2.533E+01	9.302E+00
10219770323	42156.83	1.818E-01	2.619E+01	3.067E+00	7.015E+07	9.033E+08	5.756E-01	1.178E-01	5.218E-02	2.907E+01	1.063E+01
10219770401	43031.90	1.840E-01	3.153E+01	3.928E+00	7.842E+07	1.080E+09	7.610E-01	1.344E-01	7.040E-02	3.401E+01	1.223E+01
10219776406	8931.42	1.876E-01	4.887E+01	4.193E+00	8.169E+07	1.095E+09	7.899E-01	1.378E-01	7.177E-02	3.498E+01	1.255E+01
10219770413	7324.59	1.904E-01	5.290E+01	4.399E+00	8.322E+07	1.118E+09	8.294E-01	1.406E-01	7.346E-02	3.596E+01	1.286E+01
10219770420	3308.03	1.923E-01	5.308E+01	4.486E+00	8.322E+07	1.134E+09	8.355E-01	1.419E-01	7.435E-02	3.706E+01	1.303E+01
10219770427	3619.10	1.937E-01	5.580E+01	4.587E+00	8.348E+07	1.159E+09	8.658E-01	1.433E-01	7.533E-02	3.846E+01	1.321E+01
10219770504	1805.51	1.945E-01	5.672E+01	4.639E+00	8.376E+07	1.176E+09	8.840E-01	1.440E-01	7.593E-02	3.920E+01	1.329E+01
10219770511	1003.01	1.950E-01	5.705E+01	4.665E+00	8.392E+07	1.183E+09	8.932E-01	1.444E-01	7.642E-02	3.953E+01	1.334E+01
10219770519	119.29	1.950E-01	5.707E+01	4.668E+00	8.394E+07	1.186E+09	8.943E-01	1.444E-01	7.648E-02	3.956E+01	1.335E+01
10219770526	36.31	1.950E-01	5.708E+01	4.669E+00	8.394E+07	1.187E+09	8.945E-01	1.444E-01	7.648E-02	3.957E+01	1.335E+01
10219770601	3325.13	1.959E-01	5.863E+01	4.719E+00	8.458E+07	1.225E+09	9.053E-01	1.457E-01	7.712E-02	3.992E+01	1.342E+01
10219770607	638.90	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770614	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770621	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770629	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770706	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770713	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770721	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770726	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770802	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770810	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770817	0.00	1.959E-01	5.890E+01	4.728E+00	8.472E+07	1.232E+09	9.078E-01	1.460E-01	7.732E-02	4.002E+01	1.344E+01
10219770822	9489.29	1.959E-01	5.963E+01	4.837E+00	8.935E+07	1.262E+09	1.020E+00	1.825E-01	8.097E-02	4.083E+01	1.361E+01
10219770830	2674.68	1.959E-01	5.972E+01	4.868E+00	9.034E+07	1.270E+09	1.023E+00	1.835E-01	8.118E-02	4.099E+01	1.365E+01
10219770906	48.43	1.959E-01	5.972E+01	4.869E+00	9.034E+07	1.271E+09	1.023E+00	1.835E-01	8.118E-02	4.099E+01	1.365E+01
10219770913	2884.02	1.963E-01	5.992E+01	4.905E+00	9.050E+07	1.280E+09	1.033E+00	1.847E-01	8.140E-02	4.116E+01	1.369E+01
10219770920	242.28	1.963E-01	5.993E+01	4.908E+00	9.055E+07	1.281E+09	1.035E+00	1.858E-01	8.142E-02	4.117E+01	1.370E+01
10219770927	0.00	1.963E-01	5.993E+01	4.908E+00	9.055E+07	1.281E+09	1.035E+00	1.859E-01	8.142E-02	4.117E+01	1.370E+01
10219771004	0.00	1.963E-01	5.993E+01	4.908E+00	9.055E+07	1.281E+09	1.035E+00	1.858E-01	8.142E-02	4.117E+01	1.370E+01
10219771011	0.00	1.963E-01	5.993E+01	4.908E+00	9.055E+07	1.281E+09	1.035E+00	1.858E-01	8.142E-02	4.117E+01	1.370E+01
10219771018	14.87	1.963E-01	5.993E+01	4.908E+00	9.057E+07	1.281E+09	1.035E+00	1.863E-01	8.142E-02	4.118E+01	1.370E+01
10219771025	46.02	1.964E-01	5.993E+01	4.908E+00	9.059E+07	1.281E+09	1.036E+00	1.872E-01	8.143E-02	4.118E+01	1.370E+01
10219771103	22182.90	2.399E-01	6.028E+01	5.071E+00	9.059E+07	1.284E+09	1.445E+00	3.067E-01	8.912E-02	4.383E+01	1.638E+01
10219771108	13927.41	2.592E-01	6.030E+01	5.226E+00	9.059E+07	1.287E+09	1.496E+00	3.121E-01	9.019E-02	4.533E+01	1.683E+01
10219771115	63439.68	2.910E-01	7.356E+01	6.105E+00	9.059E+07	1.305E+09	1.667E+00	3.365E-01	1.146E-01	5.119E+01	1.932E+01
10219771122	15125.89	2.979E-01	7.397E+01	6.274E+00	9.059E+07	1.308E+09	1.695E+00	3.423E-01	1.600E-01	5.212E+01	1.991E+01
10219771129	8890.94	2.979E-01	7.455E+01	6.349E+00	9.059E+07	1.309E+09	1.706E+00	3.457E-01	1.603E-01	5.270E+01	2.025E+01
10219771206	7560.29	3.008E-01	7.551E+01	6.393E+00	9.059E+07	1.311E+09	1.716E+00	3.486E-01	1.609E-01	5.308E+01	2.051E+01
10219771212	6505.80	3.044E-01	7.601E+01	6.418E+00	9.059E+07	1.313E+09	1.722E+00	3.511E-01	1.627E-01	5.375E+01	2.079E+01
10219771220	10225.91	3.099E-01	7.656E+01	6.457E+00	9.059E+07	1.318E+09	1.746E+00	3.550E-01	1.639E-01	5.501E+01	2.114E+01
10219771230	36702.62	3.282E-01	7.755E+01	6.612E+00	9.059E+07	1.347E+09	1.841E+00	3.692E-01	1.667E-01	5.883E+01	2.281E+01
10219780105	41004.63	3.282E-01	7.803E+01	6.817E+00	9.059E+07	1.395E+09	2.057E+00	4.165E-01	1.746E-01	6.451E+01	2.784E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10219770113	40713.32	1.050E+00	1.567E-01	2.977E-01	2.820E-01	0.000E+00	3.760E-01	3.133E-03	0.000E+00	0.000E+00
10219770119	41995.57	2.262E+00	3.183E-01	5.562E-01	5.244E-01	0.000E+00	7.800E-01	4.749E-03	0.000E+00	0.000E+00
10219770126	34146.76	3.326E+00	4.496E-01	7.402E-01	6.952E-01	0.000E+00	1.108E+00	4.749E-03	0.000E+00	0.000E+00
10219770131	15760.60	3.860E+00	5.103E-01	8.129E-01	7.619E-01	0.000E+00	1.266E+00	4.749E-03	0.000E+00	0.000E+00
10219770207	13306.93	4.341E+00	5.615E-01	8.744E-01	8.131E-01	0.000E+00	1.410E+00	4.749E-03	0.000E+00	0.000E+00
10219770216	10397.08	4.693E+00	5.895E-01	9.304E-01	8.531E-01	0.000E+00	1.578E+00	4.749E-03	0.000E+00	0.000E+00
10219770224	6318.17	4.890E+00	5.968E-01	9.693E-01	8.774E-01	0.000E+00	1.723E+00	4.749E-03	2.431E-04	0.000E+00
10219770302	17195.57	5.386E+00	5.968E-01	1.095E+00	9.436E-01	0.000E+00	2.233E+00	4.749E-03	2.228E-03	0.000E+00
10219770310	32620.86	6.365E+00	5.968E-01	1.308E+00	1.057E+00	0.000E+00	3.124E+00	4.749E-03	8.504E-03	0.000E+00
10219770317	51593.06	7.993E+00	6.166E-01	1.606E+00	1.215E+00	0.000E+00	4.395E+00	6.734E-03	2.439E-02	0.000E+00
10219770323	42158.83	9.388E+00	6.491E-01	1.833E+00	1.329E+00	0.000E+00	5.336E+00	9.979E-03	4.223E-02	0.000E+00
10219770401	43031.96	1.080E+01	6.988E-01	2.065E+00	1.445E+00	0.000E+00	6.230E+00	1.495E-02	6.541E-02	0.000E+00
10219770406	8931.42	1.120E+01	7.538E-01	2.130E+00	1.483E+00	0.000E+00	6.780E+00	1.563E-02	6.919E-02	0.000E+00
10219770413	7324.59	1.148E+01	8.186E-01	2.192E+00	1.519E+00	0.000E+00	7.397E+00	1.592E-02	7.173E-02	0.000E+00
10219770420	3308.03	1.161E+01	8.606E-01	2.225E+00	1.540E+00	0.000E+00	7.780E+00	1.604E-02	7.249E-02	0.000E+00
10219770427	3619.10	1.176E+01	9.205E-01	2.267E+00	1.566E+00	0.000E+00	8.315E+00	1.618E-02	7.305E-02	0.000E+00
10219770504	1805.51	1.184E+01	9.580E-01	2.292E+00	1.583E+00	0.000E+00	8.639E+00	1.632E-02	7.326E-02	0.000E+00
10219770511	1003.01	1.188E+01	9.746E-01	2.303E+00	1.591E+00	0.000E+00	8.782E+00	1.636E-02	7.334E-02	0.000E+00
10219770519	119.20	1.189E+01	9.760E-01	2.304E+00	1.591E+00	0.000E+00	8.794E+00	1.636E-02	7.334E-02	0.000E+00
10219770526	36.31	1.189E+01	9.763E-01	2.304E+00	1.591E+00	0.000E+00	8.796E+00	1.636E-02	7.334E-02	0.000E+00
10219770601	3325.13	1.211E+01	9.904E-01	2.321E+00	1.604E+00	0.000E+00	8.879E+00	1.636E-02	7.360E-02	0.000E+00
10219770607	638.90	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770614	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770621	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770629	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770706	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770713	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770721	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770726	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770802	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770810	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770817	0.00	1.215E+01	9.931E-01	2.324E+00	1.607E+00	0.000E+00	8.894E+00	1.636E-02	7.365E-02	0.000E+00
10219770822	9489.29	1.237E+01	1.041E+00	2.426E+00	1.650E+00	0.000E+00	8.938E+00	1.636E-02	7.474E-02	0.000E+00
10219770830	2674.68	1.243E+01	1.054E+00	2.456E+00	1.663E+00	0.000E+00	8.948E+00	1.636E-02	7.505E-02	0.000E+00
10219770906	48.43	1.243E+01	1.054E+00	2.457E+00	1.663E+00	0.000E+00	8.948E+00	1.636E-02	7.506E-02	0.000E+00
10219770913	2884.02	1.249E+01	1.055E+00	2.476E+00	1.675E+00	2.219E-04	8.959E+00	1.658E-02	7.539E-02	0.000E+00
10219770920	242.28	1.250E+01	1.055E+00	2.478E+00	1.676E+00	2.313E-04	8.960E+00	1.660E-02	7.542E-02	0.000E+00
10219770927	0.00	1.250E+01	1.055E+00	2.478E+00	1.676E+00	2.313E-04	8.960E+00	1.660E-02	7.542E-02	0.000E+00
10219771004	0.00	1.250E+01	1.055E+00	2.478E+00	1.676E+00	2.313E-04	8.960E+00	1.660E-02	7.542E-02	0.000E+00
10219771011	0.00	1.250E+01	1.055E+00	2.478E+00	1.676E+00	2.313E-04	8.960E+00	1.660E-02	7.542E-02	0.000E+00
10219771018	14.87	1.250E+01	1.055E+00	2.479E+00	1.677E+00	2.318E-04	8.960E+00	1.660E-02	7.542E-02	0.000E+00
10219771025	46.02	1.250E+01	1.055E+00	2.481E+00	1.677E+00	2.336E-04	8.960E+00	1.661E-02	7.543E-02	0.000E+00
10219771103	22182.90	1.318E+01	1.055E+00	3.445E+00	1.873E+00	1.941E-03	9.011E+00	2.087E-02	7.970E-02	0.000E+00
10219771108	13927.41	1.352E+01	1.055E+00	3.853E+00	1.959E+00	2.477E-03	9.038E+00	2.248E-02	8.130E-02	0.000E+00
10219771115	63439.68	1.478E+01	1.055E+00	5.220E+00	2.252E+00	4.918E-03	9.160E+00	2.736E-02	8.619E-02	0.000E+00
10219771122	15125.89	1.501E+01	1.055E+00	5.383E+00	2.287E+00	5.500E-03	9.189E+00	2.795E-02	8.677E-02	0.000E+00
10219771129	8890.94	1.509E+01	1.055E+00	5.383E+00	2.294E+00	5.842E-03	9.206E+00	2.795E-02	8.711E-02	0.000E+00
10219771206	7560.29	1.533E+01	1.067E+00	5.479E+00	2.343E+00	6.133E-03	9.220E+00	2.853E-02	8.769E-02	0.000E+00
10219771212	6505.80	1.557E+01	1.074E+00	5.566E+00	2.396E+00	6.383E-03	9.243E+00	2.953E-02	8.989E-02	0.000E+00
10219771220	10225.91	1.598E+01	1.082E+00	5.712E+00	2.490E+00	6.777E-03	9.294E+00	3.189E-02	9.339E-02	0.000E+00
10219771230	36702.62	1.766E+01	1.096E+00	6.277E+00	2.900E+00	8.189E-03	9.548E+00	4.460E-02	1.061E-01	0.000E+00
10219780105	41004.63	1.984E+01	1.096E+00	7.002E+00	3.460E+00	1.134E-02	9.943E+00	6.511E-02	1.110E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10219780110	23120.12	6.227E-03	1.779E-01	1.423E-01	0.000E+00	2.256E+08	4.982E-02	8.896E-03	2.669E-03	2.491E+00	1.005E+00
10219780117	40860.61	9.372E-03	9.641E-01	4.568E-01	0.000E+00	9.176E+08	1.111E-01	4.034E-02	8.958E-03	5.164E+00	2.216E+00
10219780124	139171.00	6.828E-02	1.500E+00	1.742E+00	0.000E+00	2.176E+09	4.860E-01	9.389E-02	1.967E-02	1.002E+01	5.483E+00
10219780131	193837.06	9.811E-02	2.991E+00	3.839E+00	0.000E+00	2.403E+09	1.530E+00	1.685E-01	7.934E-02	4.263E+01	1.264E+01
10219780207	81276.13	1.944E-01	9.872E+00	4.550E+00	0.000E+00	2.455E+09	1.687E+00	1.998E-01	8.559E-02	4.888E+01	1.533E+01
10219780216	26610.41	1.074E-01	1.274E+01	4.734E+00	0.000E+00	2.459E+09	1.736E+00	2.100E-01	8.764E-02	5.063E+01	1.601E+01
10219780224	35846.93	1.102E-01	1.481E+01	4.969E+00	0.000E+00	2.468E+09	1.852E+00	2.238E-01	8.902E-02	5.228E+01	1.750E+01
10219780228	18397.28	1.116E-01	1.828E+01	5.089E+00	0.000E+00	2.476E+09	1.893E+00	2.309E-01	9.044E-02	5.320E+01	1.838E+01
10219780308	60778.41	1.233E-01	2.342E+01	5.416E+00	0.000E+00	2.494E+09	1.999E+00	2.543E-01	9.979E-02	5.671E+01	2.039E+01
10219780314	58071.39	1.368E-01	2.387E+01	5.617E+00	0.000E+00	2.497E+09	2.110E+00	2.766E-01	1.020E-01	6.118E+01	2.197E+01
10219780321	25903.06	1.618E-01	2.506E+01	5.857E+00	0.000E+00	2.498E+09	2.149E+00	2.866E-01	1.020E-01	6.297E+01	2.259E+01
10219780329	46250.18	1.654E-01	2.542E+01	6.622E+00	0.000E+00	2.501E+09	2.299E+00	3.044E-01	1.056E-01	6.724E+01	2.369E+01
10219780405	35564.93	1.722E-01	2.788E+01	7.169E+00	0.000E+00	2.535E+09	2.326E+00	3.189E-01	1.056E-01	7.039E+01	2.454E+01
10219780412	9949.62	1.730E-01	2.922E+01	7.315E+00	0.000E+00	2.553E+09	2.330E+00	3.189E-01	1.056E-01	7.116E+01	2.478E+01
10219780419	5892.56	1.730E-01	3.040E+01	7.399E+00	1.029E+05	2.569E+09	2.331E+00	3.203E-01	1.058E-01	7.156E+01	2.493E+01
10219780425	6461.67	1.745E-01	3.334E+01	7.511E+00	1.029E+05	2.579E+09	2.355E+00	3.228E-01	1.066E-01	7.246E+01	2.516E+01
10219780427	11277.34	1.810E-01	3.381E+01	7.741E+00	1.029E+05	2.588E+09	2.358E+00	3.271E-01	1.074E-01	7.367E+01	2.543E+01
10219780502	44524.98	1.878E-01	3.775E+01	8.700E+00	1.029E+05	2.611E+09	2.545E+00	3.443E-01	1.109E-01	7.796E+01	2.658E+01
10219780510	64209.36	2.002E-01	3.973E+01	9.762E+00	1.029E+05	2.658E+09	2.663E+00	3.690E-01	1.183E-01	8.339E+01	2.824E+01
10219780516	74793.06	2.203E-01	4.349E+01	1.042E+01	1.409E+06	2.741E+09	2.793E+00	3.978E-01	1.269E-01	8.808E+01	3.028E+01
10219780522	27805.38	2.289E-01	5.683E+01	1.068E+01	1.894E+06	2.825E+09	2.846E+00	4.085E-01	1.290E-01	9.039E+01	3.093E+01
10219780529	6455.47	2.294E-01	6.093E+01	1.075E+01	2.007E+06	2.856E+09	2.883E+00	4.109E-01	1.298E-01	9.176E+01	3.111E+01
10219780606	48176.43	2.479E-01	8.132E+01	1.117E+01	2.848E+06	3.068E+09	3.090E+00	4.295E-01	1.353E-01	1.036E+02	3.215E+01
10219780614	142453.63	3.027E-01	9.173E+01	1.227E+01	5.335E+06	3.615E+09	3.518E+00	4.843E-01	1.408E-01	1.212E+02	3.465E+01
10219780620	29702.08	3.039E-01	1.012E+02	1.271E+01	3.230E+07	4.050E+09	3.630E+00	4.957E-01	1.465E-01	1.255E+02	3.533E+01
10219780628	8980.75	3.056E-01	1.036E+02	1.290E+01	4.673E+07	4.253E+09	3.671E+00	4.992E-01	1.531E-01	1.275E+02	3.557E+01
10219780705	2146.31	3.063E-01	1.069E+02	1.294E+01	4.931E+07	4.320E+09	3.688E+00	5.000E-01	1.536E-01	1.282E+02	3.565E+01
10219780712	3992.85	3.070E-01	1.087E+02	1.298E+01	5.273E+07	4.473E+09	3.715E+00	5.000E-01	1.544E-01	1.291E+02	3.570E+01
10219780718	7169.25	3.076E-01	1.104E+02	1.305E+01	5.546E+07	4.793E+09	3.756E+00	5.000E-01	1.557E-01	1.304E+02	3.598E+01
10219780725	6751.43	3.078E-01	1.124E+02	1.312E+01	5.546E+07	5.135E+09	3.789E+00	5.026E-01	1.570E-01	1.313E+02	3.613E+01
10219780801	3305.54	3.089E-01	1.135E+02	1.315E+01	5.546E+07	5.225E+09	3.829E+00	5.064E-01	1.579E-01	1.320E+02	3.624E+01
10219780808	30482.10	3.138E-01	1.170E+02	1.351E+01	5.546E+07	5.336E+09	3.926E+00	5.101E-01	1.650E-01	1.357E+02	3.688E+01
10219780814	16479.63	3.164E-01	1.175E+02	1.381E+01	5.920E+07	5.689E+09	3.974E+00	5.245E-01	1.681E-01	1.377E+02	3.723E+01
10219780823	44032.84	3.164E-01	1.242E+02	1.401E+01	7.042E+07	7.304E+09	4.140E+00	5.414E-01	1.749E-01	1.427E+02	3.823E+01
10219780829	3884.42	3.167E-01	1.251E+02	1.491E+01	1.018E+08	7.380E+09	4.161E+00	5.429E-01	1.757E-01	1.433E+02	3.836E+01
10219780905	2976.64	3.168E-01	1.255E+02	1.499E+01	1.309E+08	7.404E+09	4.183E+00	5.441E-01	1.766E-01	1.433E+02	3.843E+01
10219780912	185.92	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219780919	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219780926	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781003	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781010	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781017	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781025	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781031	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781109	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781114	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781121	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781128	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781205	0.00	3.168E-01	1.256E+02	1.500E+01	1.326E+08	7.406E+09	4.185E+00	5.441E-01	1.766E-01	1.433E+02	3.846E+01
10219781213	3763.80	3.168E-01	1.258E+02	1.502E+01	1.327E+08	7.564E+09	4.217E+00	9.300E-01	2.333E-01	1.433E+02	3.855E+01
10219781219	1593.98	3.170E-01	1.258E+02	1.503E+01	1.328E+08	7.596E+09	4.240E+00	9.517E-01	2.366E-01	1.433E+02	3.858E+01
10219781228	8838.16	3.180E-01	1.269E+02	1.511E+01	1.342E+08	7.623E+09	4.270E+00	9.585E-01	2.451E-01	1.433E+02	3.873E+01
10219790104	28128.81	3.321E-01	1.266E+02	1.529E+01	1.391E+08	7.720E+09	4.358E+00	9.693E-01	2.537E-01	1.433E+02	3.927E+01

Appendix E (Cont'd)

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CUMULATIVE NUTRIENT  MASS TABLE

ST. DATE     FLOW VOLUME          NA          K         CA         MG         CU         FE         MN        ZN*         CD
10219780110       23120.12 1.130E+00 0.000E+00 3.736E-01 2.847E-01 8.896E-04 2.046E-01 8.896E-03 3.096E-01 0.000E+00
10219780117       40860.61 2.985E+00 0.000E+00 9.711E-01 7.406E-01 2.462E-03 5.505E-01 2.147E-02 7.561E-01 0.000E+00
10219780124      139171.00 8.608E+00 0.000E+00 2.738E+00 2.979E+00 7.817E-03 1.622E+00 4.825E-02 1.795E+00 0.000E+00
10219780131      193837.06 1.554E+01 0.000E+00 4.901E+00 3.646E+00 1.528E-02 3.039E+00 7.063E-02 2.378E+00 0.000E+00
10219780207       81276.13 1.868E+01 0.000E+00 5.683E+00 4.209E+00 1.840E-02 3.602E+00 7.688E-02 2.628E+00 0.000E+00
10219780216       26610.41 1.885E+01 5.120E-02 5.929E+00 4.383E+00 1.943E-02 3.776E+00 7.790E-02 2.640E+00 0.000E+00
10219780224       35846.93 1.978E+01 2.167E-01 6.246E+00 4.603E+00 2.081E-02 3.996E+00 7.928E-02 2.652E+00 0.000E+00
10219780228       18397.28 2.022E+01 3.441E-01 6.402E+00 4.717E+00 2.222E-02 4.103E+00 7.999E-02 2.654E+00 0.000E+00
10219780308       60778.41 2.160E+01 8.587E-01 6.916E+00 5.114E+00 2.924E-02 4.477E+00 8.467E-02 2.661E+00 0.000E+00
10219780314       58071.39 2.294E+01 1.194E+00 7.363E+00 5.472E+00 3.371E-02 4.790E+00 8.690E-02 2.668E+00 0.000E+00
10219780321       25903.06 2.354E+01 1.294E+00 7.553E+00 5.621E+00 3.470E-02 4.919E+00 8.790E-02 2.671E+00 0.000E+00
10219780329       46250.18 2.465E+01 1.382E+00 7.873E+00 5.888E+00 3.470E-02 5.133E+00 8.968E-02 2.676E+00 0.000E+00
10219780405       35564.93 2.554E+01 1.382E+00 8.119E+00 6.107E+00 3.470E-02 5.283E+00 9.242E-02 2.682E+00 0.000E+00
10219780412        9949.62 2.579E+01 1.382E+00 8.188E+00 6.165E+00 3.470E-02 5.383E+00 9.280E-02 2.683E+00 0.000E+00
10219780419        5892.56 2.595E+01 1.382E+00 8.229E+00 6.199E+00 3.470E-02 5.476E+00 9.303E-02 2.683E+00 0.000E+00
10219780425        6461.67 2.613E+01 1.382E+00 8.274E+00 6.236E+00 3.470E-02 5.615E+00 9.328E-02 2.684E+00 0.000E+00
10219780427       11277.34 2.645E+01 1.382E+00 8.352E+00 6.301E+00 3.514E-02 5.914E+00 9.371E-02 2.684E+00 0.000E+00
10219780502       44524.98 2.773E+01 1.382E+00 8.660E+00 6.575E+00 3.856E-02 7.165E+00 9.542E-02 2.686E+00 0.000E+00
10219780510       64209.30 2.954E+01 1.382E+00 9.105E+00 6.946E+00 4.104E-02 9.241E+00 9.789E-02 2.688E+00 0.000E+00
10219780516       74793.06 3.155E+01 1.382E+00 9.623E+00 7.377E+00 4.391E-02 1.218E+01 1.008E-01 2.691E+00 0.000E+00
10219780522       27805.38 3.228E+01 1.382E+00 9.816E+00 7.538E+00 4.498E-02 1.341E+01 1.018E-01 2.692E+00 0.000E+00
10219780529        6455.47 3.244E+01 1.382E+00 9.860E+00 7.575E+00 4.523E-02 1.372E+01 1.021E-01 2.693E+00 0.000E+00
10219780606       48176.43 3.365E+01 1.382E+00 1.023E+01 7.872E+00 4.709E-02 1.641E+01 1.058E-01 2.698E+00 0.000E+00
10219780614      142453.63 3.743E+01 1.382E+00 1.138E+01 8.804E+00 5.257E-02 2.699E+01 1.168E-01 2.715E+00 0.000E+00
10219780620       29702.08 3.826E+01 1.382E+00 1.163E+01 9.009E+00 5.371E-02 2.975E+01 1.190E-01 2.718E+00 0.000E+00
10219780628        8980.75 3.853E+01 1.382E+00 1.171E+01 9.072E+00 5.406E-02 3.070E+01 1.197E-01 2.719E+00 0.000E+00
10219780705        2146.31 3.859E+01 1.382E+00 1.173E+01 9.088E+00 5.430E-02 3.097E+01 1.200E-01 2.719E+00 0.000E+00
10219780712        3992.85 3.872E+01 1.382E+00 1.177E+01 9.117E+00 5.461E-02 3.147E+01 1.203E-01 2.720E+00 0.000E+00
10219780718        7109.25 3.894E+01 1.382E+00 1.184E+01 9.167E+00 5.488E-02 3.233E+01 1.208E-01 2.721E+00 0.000E+00
10219780725        6751.43 3.915E+01 1.382E+00 1.191E+01 9.213E+00 5.514E-02 3.313E+01 1.214E-01 2.722E+00 0.000E+00
10219780801        3305.54 3.925E+01 1.382E+00 1.194E+01 9.236E+00 5.527E-02 3.352E+01 1.217E-01 2.723E+00 0.000E+00
10219780808       39482.10 4.004E+01 1.441E+00 1.223E+01 9.447E+00 5.527E-02 3.665E+01 1.241E-01 2.727E+00 0.000E+00
10219780814       16479.63 4.038E+01 1.511E+00 1.239E+01 9.561E+00 5.527E-02 3.811E+01 1.247E-01 2.729E+00 0.000E+00
10219780823       44032.84 4.105E+01 1.782E+00 1.281E+01 9.866E+00 5.527E-02 4.144E+01 1.264E-01 2.733E+00 0.000E+00
10219780829        3884.42 4.109E+01 1.818E+00 1.285E+01 9.895E+00 5.527E-02 4.167E+01 1.266E-01 2.733E+00 0.000E+00
10219780905        2976.64 4.110E+01 1.852E+00 1.288E+01 9.918E+00 5.527E-02 4.180E+01 1.268E-01 2.733E+00 0.000E+00
10219780912         185.92 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219780919           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219780926           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781003           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781010           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781017           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781025           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781031           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781109           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781114           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781121           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781128           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781205           0.00 4.110E+01 1.854E+00 1.288E+01 9.919E+00 5.527E-02 4.181E+01 1.268E-01 2.733E+00 0.000E+00
10219781213        3763.80 4.119E+01 1.889E+00 1.292E+01 9.945E+00 5.527E-02 4.186E+01 1.271E-01 2.733E+00 0.000E+00
10219781219        1593.98 4.123E+01 1.904E+00 1.294E+01 9.956E+00 5.527E-02 4.188E+01 1.272E-01 2.734E+00 0.000E+00
10219781220        8838.16 4.146E+01 1.985E+00 1.303E+01 1.002E+01 5.527E-02 4.195E+01 1.279E-01 2.734E+00 0.000E+00
10219790104       28128.81 4.227E+01 2.245E+00 1.336E+01 1.021E+01 5.635E-02 4.212E+01 1.311E-01 2.737E+00 0.000E+00
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*Due to mistake, Zn is high by 2.5109 in 1978.

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10219790116	84586.50	3.580E-02	6.510E-01	4.557E-01	1.034E+07	2.097E+08	2.181E-01	3.255E-02	0.000E+00	0.000E+00	2.116E+00
10219790123	84586.50	3.580E-02	1.302E+00	9.764E-01	1.034E+07	2.791E+08	4.915E-01	6.510E-02	9.764E-03	0.000E+00	4.524E+00
10219790130	48056.56	3.580E-02	3.336E+00	1.161E+00	1.034E+07	3.076E+08	5.691E-01	8.359E-02	1.531E-02	0.000E+00	6.077E+00
10219790206	20379.38	3.580E-02	4.512E+00	1.201E+00	1.034E+07	3.151E+08	6.413E-01	9.143E-02	1.845E-02	0.000E+00	6.791E+00
10219790213	23755.19	4.129E-02	6.706E+00	1.338E+00	1.034E+07	3.234E+08	6.925E-01	1.006E-01	1.936E-02	0.000E+00	7.678E+00
10219790222	36135.28	4.546E-02	8.096E+00	1.699E+00	1.034E+07	3.354E+08	7.856E-01	1.145E-01	2.075E-02	0.000E+00	8.901E+00
10219790227	33815.12	4.806E-02	8.877E+00	2.220E+00	1.034E+07	3.466E+08	8.663E-01	1.275E-01	2.205E-02	0.000E+00	1.002E+01
10219790307	45479.22	4.806E-02	1.080E+01	3.060E+00	1.034E+07	3.601E+08	9.591E-01	1.450E-01	2.205E-02	0.000E+00	1.140E+01
10219790313	34109.41	4.806E-02	1.421E+01	3.860E+00	1.034E+07	3.696E+08	1.047E+00	1.581E-01	2.337E-02	0.000E+00	1.254E+01
10219790320	23603.57	4.806E-02	1.621E+01	4.242E+00	1.034E+07	3.750E+08	1.085E+00	1.672E-01	2.337E-02	0.000E+00	1.331E+01
10219790327	27234.95	4.806E-02	1.703E+01	4.451E+00	1.034E+07	3.802E+08	1.182E+00	1.777E-01	2.441E-02	0.000E+00	1.417E+01
10219790405	27285.05	5.541E-02	1.768E+01	4.672E+00	1.034E+07	3.831E+08	1.232E+00	1.882E-01	2.441E-02	0.000E+00	1.501E+01
10219790411	14421.97	5.541E-02	1.846E+01	4.805E+00	1.034E+07	3.831E+08	1.257E+00	1.937E-01	2.552E-02	0.000E+00	1.541E+01
10219790417	39379.87	6.147E-02	1.906E+01	5.260E+00	1.034E+07	3.886E+08	1.311E+00	2.089E-01	2.704E-02	0.000E+00	1.644E+01
10219790424	16447.72	6.147E-02	1.982E+01	5.500E+00	1.034E+07	3.932E+08	1.343E+00	2.152E-01	2.767E-02	0.000E+00	1.688E+01
10219790501	22696.86	6.322E-02	2.105E+01	5.736E+00	1.034E+07	4.074E+08	1.373E+00	2.239E-01	2.855E-02	0.000E+00	1.744E+01
10219790508	11778.06	6.458E-02	2.159E+01	5.813E+00	1.034E+07	4.192E+08	1.512E+00	2.285E-01	2.991E-02	0.000E+00	1.779E+01
10219790516	27225.14	7.619E-02	2.264E+01	5.970E+00	1.034E+07	4.472E+08	1.600E+00	2.389E-01	3.200E-02	0.000E+00	1.836E+01
10219790522	63986.48	7.619E-02	2.707E+01	6.315E+00	1.034E+07	5.176E+08	1.945E+00	2.636E-01	3.446E-02	0.000E+00	1.959E+01
10219790529	45132.80	7.957E-02	3.124E+01	6.593E+00	1.034E+07	5.680E+08	2.041E+00	2.809E-01	3.620E-02	0.000E+00	2.048E+01
10219790606	35717.10	8.095E-02	3.179E+01	6.860E+00	1.034E+07	6.098E+08	2.107E+00	2.947E-01	3.757E-02	0.000E+00	2.126E+01
10219790612	15002.60	8.210E-02	3.369E+01	7.081E+00	1.478E+08	8.327E+08	2.193E+00	3.120E-01	3.988E-02	0.000E+00	2.171E+01
10219790619	3607.18	8.238E-02	3.447E+01	7.150E+00	2.057E+08	9.233E+08	2.270E+00	3.134E-01	4.016E-02	0.000E+00	2.182E+01
10219790626	1207.40	8.261E-02	3.479E+01	7.170E+00	2.348E+08	9.681E+08	2.278E+00	3.143E-01	4.044E-02	0.000E+00	2.189E+01
10219790703	1035.01	8.297E-02	3.500E+01	7.184E+00	2.680E+08	1.019E+09	2.285E+00	3.147E-01	4.072E-02	0.000E+00	2.193E+01
10219790710	330.21	8.313E-02	3.506E+01	7.187E+00	2.813E+08	1.039E+09	2.288E+00	3.150E-01	4.083E-02	0.000E+00	2.194E+01
10219790717	0.00	8.315E-02	3.506E+01	7.187E+00	2.813E+08	1.039E+09	2.288E+00	3.150E-01	4.083E-02	0.000E+00	2.194E+01
10219790723	4551.31	8.420E-02	3.536E+01	7.212E+00	1.076E+09	1.049E+09	2.299E+00	3.167E-01	4.101E-02	0.000E+00	2.195E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10219790116	84586.50	2.101E+00	6.184E-01	1.660E+00	6.510E-01	3.255E-03	4.557E-01	6.510E-03	6.510E-03	0.000E+00
10219790123	84586.50	4.199E+00	1.139E+00	3.710E+00	1.334E+00	6.510E-03	8.788E-01	1.302E-02	9.764E-03	0.000E+00
10219790130	48056.56	5.271E+00	1.398E+00	5.097E+00	1.760E+00	8.359E-03	1.082E+00	1.672E-02	1.161E-02	0.000E+00
10219790206	20379.38	5.695E+00	1.492E+00	5.787E+00	1.956E+00	9.927E-03	1.168E+00	1.907E-02	1.318E-02	0.000E+00
10219790213	23755.19	6.188E+00	1.584E+00	6.436E+00	2.148E+00	1.081E-02	1.260E+00	2.181E-02	1.410E-02	0.000E+00
10219790222	36135.28	6.939E+00	1.695E+00	7.187E+00	2.398E+00	1.084E-02	1.385E+00	2.737E-02	1.410E-02	0.000E+00
10219790227	33815.12	7.642E+00	1.773E+00	7.617E+00	2.580E+00	1.084E-02	1.489E+00	3.388E-02	1.410E-02	0.000E+00
10219790307	45479.22	8.604E+00	1.860E+00	8.002E+00	2.808E+00	1.084E-02	1.629E+00	4.613E-02	1.410E-02	0.000E+00
10219790313	34109.41	9.339E+00	1.900E+00	8.264E+00	2.978E+00	1.084E-02	1.760E+00	5.269E-02	1.410E-02	0.000E+00
10219790320	23603.57	9.857E+00	1.918E+00	8.437E+00	3.096E+00	1.084E-02	1.860E+00	5.542E-02	1.410E-02	0.000E+00
10219790327	27234.95	1.046E+01	1.928E+00	8.625E+00	3.233E+00	1.189E-02	1.996E+00	5.646E-02	1.410E-02	0.000E+00
10219790405	27285.05	1.109E+01	1.928E+00	8.814E+00	3.380E+00	1.399E-02	2.164E+00	5.646E-02	1.410E-02	0.000E+00
10219790411	14421.97	1.145E+01	1.934E+00	8.920E+00	3.452E+00	1.510E-02	2.248E+00	5.646E-02	1.410E-02	0.000E+00
10219790417	39379.87	1.247E+01	1.964E+00	9.208E+00	3.634E+00	1.813E-02	2.475E+00	5.646E-02	1.410E-02	0.000E+00
10219790424	16447.72	1.291E+01	1.983E+00	9.334E+00	3.763E+00	1.940E-02	2.570E+00	5.646E-02	1.410E-02	0.000E+00
10219790501	22696.86	1.356E+01	2.036E+00	9.526E+00	3.808E+00	2.202E-02	2.701E+00	5.821E-02	1.410E-02	0.000E+00
10219790508	11778.06	1.369E+01	2.058E+00	9.622E+00	3.838E+00	2.292E-02	2.778E+00	5.912E-02	1.410E-02	0.000E+00
10219790516	27225.14	1.464E+01	2.111E+00	9.831E+00	3.963E+00	2.397E-02	2.977E+00	6.121E-02	1.410E-02	0.000E+00
10219790522	63986.48	1.634E+01	2.234E+00	1.030E+01	4.184E+00	2.643E-02	3.519E+00	6.614E-02	1.410E-02	0.000E+00
10219790529	45132.80	1.752E+01	2.321E+00	1.061E+01	4.341E+00	2.817E-02	3.936E+00	6.961E-02	1.410E-02	0.000E+00
10219790606	35717.10	1.842E+01	2.389E+00	1.085E+01	4.464E+00	2.954E-02	4.293E+00	7.236E-02	1.410E-02	0.000E+00
10219790612	15002.60	1.879E+01	2.418E+00	1.094E+01	4.516E+00	3.012E-02	4.460E+00	7.351E-02	1.410E-02	0.000E+00
10219790619	3607.18	1.888E+01	2.425E+00	1.096E+01	4.529E+00	3.026E-02	4.503E+00	7.379E-02	1.410E-02	0.000E+00
10219790626	1207.40	1.891E+01	2.427E+00	1.096E+01	4.533E+00	3.030E-02	4.519E+00	7.388E-02	1.410E-02	0.000E+00
10219790703	1035.01	1.893E+01	2.429E+00	1.097E+01	4.536E+00	3.034E-02	4.534E+00	7.396E-02	1.410E-02	0.000E+00
10219790710	330.21	1.894E+01	2.430E+00	1.097E+01	4.538E+00	3.036E-02	4.539E+00	7.399E-02	1.410E-02	0.000E+00
10219790717	0.00	1.894E+01	2.430E+00	1.097E+01	4.538E+00	3.036E-02	4.539E+00	7.399E-02	1.410E-02	0.000E+00
10219790723	4551.31	1.904E+01	2.439E+00	1.100E+01	4.553E+00	3.053E-02	4.619E+00	7.434E-02	1.427E-02	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10319760714	93602.44	3.930E-03	2.896E-01	1.055E-01	2.158E+07	9.384E+07	3.785E-02	2.068E-03	6.619E-02	1.117E+00	1.861E-01
10319760721	299893.94	2.090E-02	1.011E+00	5.382E-01	1.406E+08	9.714E+08	1.388E-01	2.068E-03	2.380E-01	4.395E+00	7.107E-01
10319760727	123216.56	3.021E-02	1.228E+00	7.636E-01	2.108E+08	1.575E+09	1.730E-01	4.784E-03	2.936E-01	5.644E+00	9.062E-01
10319760803	142919.31	4.510E-02	1.735E+00	9.696E-01	2.913E+08	2.286E+09	2.104E-01	7.952E-03	3.500E-01	7.482E+00	1.122E+00
10319760810	142919.31	4.839E-02	2.052E+00	1.112E+00	3.704E+08	3.005E+09	2.725E-01	1.112E-02	4.920E-01	9.605E+00	1.438E+00
10319760817	107873.75	4.859E-02	2.689E+00	1.230E+00	4.533E+08	3.572E+09	3.162E-01	1.348E-02	5.182E-01	1.083E+01	1.608E+00
10319760824	52834.44	4.870E-02	3.104E+00	1.294E+00	5.057E+08	3.866E+09	3.359E-01	1.925E-02	5.249E-01	1.142E+01	1.693E+00
10319760831	56245.35	4.870E-02	3.572E+00	1.360E+00	5.514E+08	4.190E+09	3.638E-01	2.417E-02	5.290E-01	1.194E+01	1.770E+00
10319760907	33651.00	4.981E-02	3.770E+00	1.399E+00	5.726E+08	4.391E+09	3.821E-01	2.491E-02	5.301E-01	1.224E+01	1.822E+00
10319760916	41181.55	5.123E-02	3.935E+00	1.450E+00	5.925E+08	4.664E+09	3.957E-01	2.588E-02	5.317E-01	1.264E+01	1.883E+00
10319760922	70674.19	5.249E-02	4.027E+00	1.532E+00	6.079E+08	5.119E+09	4.226E-01	2.742E-02	5.454E-01	1.326E+01	2.013E+00
10319760928	33654.50	5.439E-02	4.103E+00	1.568E+00	6.141E+08	5.283E+09	4.338E-01	2.818E-02	5.482E-01	1.419E+01	2.071E+00
10319761005	42163.00	5.457E-02	4.168E+00	1.609E+00	6.200E+08	5.408E+09	4.498E-01	3.371E-02	5.517E-01	1.482E+01	2.132E+00
10319761012	0.00	5.457E-02	4.168E+00	1.609E+00	6.200E+08	5.408E+09	4.498E-01	3.371E-02	5.517E-01	1.482E+01	2.132E+00
10319761019	24990.54	5.517E-02	4.233E+00	1.633E+00	6.266E+08	5.434E+09	4.575E-01	3.426E-02	5.530E-01	1.507E+01	2.168E+00
10319761026	120833.13	5.702E-02	4.418E+00	1.749E+00	6.661E+08	5.610E+09	4.870E-01	3.690E-02	5.660E-01	1.631E+01	2.438E+00
10319761102	71017.00	6.416E-02	5.024E+00	1.796E+00	6.794E+08	5.664E+09	5.075E-01	3.845E-02	5.741E-01	1.699E+01	2.565E+00
10319761109	32568.52	6.822E-02	5.066E+00	1.807E+00	6.810E+08	5.672E+09	5.167E-01	3.987E-02	5.771E-01	1.724E+01	2.620E+00
10319761115	26712.96	7.441E-02	5.148E+00	1.821E+00	6.842E+08	5.682E+09	5.270E-01	4.046E-02	5.809E-01	1.745E+01	2.638E+00
10319761122	135796.00	1.378E-01	5.507E+00	1.917E+00	7.086E+08	5.755E+09	5.725E-01	4.345E-02	6.161E-01	1.837E+01	2.981E+00
10319761130	140970.19	1.714E-01	5.813E+00	2.006E+00	8.981E+08	5.856E+09	6.199E-01	4.653E-02	6.513E-01	1.967E+01	3.252E+00
10319761207	127139.06	1.973E-01	6.093E+00	2.079E+00	1.239E+09	5.974E+09	6.566E-01	4.931E-02	6.908E-01	2.103E+01	3.542E+00
10319761214	361724.69	2.922E-01	6.251E+00	2.268E+00	1.814E+09	6.374E+09	7.760E-01	5.722E-02	6.434E-01	2.498E+01	4.356E+00
10319761220	812964.13	3.423E-01	6.788E+00	2.680E+00	2.229E+09	7.430E+09	1.132E+00	1.646E-01	1.422E+00	3.286E+01	6.523E+00
10319761229	436843.38	3.566E-01	7.170E+00	2.843E+00	2.361E+09	7.770E+09	1.263E+00	2.506E-01	1.722E+00	3.764E+01	7.658E+00
10319770104	179989.94	3.606E-01	7.210E+00	2.882E+00	2.361E+09	7.772E+09	1.367E+00	2.821E-01	1.851E+00	3.964E+01	8.098E+00

CUMULATIVE NUTRIENT MASS TABLE

ST DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10319760714	93602.44	9.307E-02	5.998E-02	3.826E-01	6.412E-02	0.000E+00	1.655E-02	0.000E+00	0.000E+00	0.000E+00
10319760721	299893.94	4.209E-01	2.173E-01	1.740E+00	2.870E-01	0.000E+00	6.900E-02	0.000E+00	0.000E+00	0.000E+00
10319760727	123216.56	5.703E-01	2.689E-01	2.364E+00	3.875E-01	0.000E+00	9.072E-02	0.000E+00	0.000E+00	0.000E+00
10319760803	142919.31	7.604E-01	3.165E-01	3.157E+00	5.143E-01	0.000E+00	1.192E-01	0.000E+00	0.000E+00	0.000E+00
10319760810	142919.31	9.441E-01	3.640E-01	3.958E+00	6.442E-01	0.000E+00	1.446E-01	0.000E+00	0.000E+00	0.000E+00
10319760817	107873.75	1.076E+00	3.994E-01	4.562E+00	7.456E-01	0.000E+00	1.635E-01	0.000E+00	0.000E+00	0.000E+00
10319760824	52834.44	1.139E+00	4.167E-01	4.862E+00	7.964E-01	0.000E+00	1.727E-01	0.000E+00	0.000E+00	0.000E+00
10319760831	56245.35	1.203E+00	4.331E-01	5.187E+00	8.530E-01	0.000E+00	1.825E-01	0.000E+00	0.000E+00	0.000E+00
10319760907	33651.00	1.239E+00	4.462E-01	5.384E+00	8.883E-01	0.000E+00	1.884E-01	0.000E+00	0.000E+00	0.000E+00
10319760916	41181.55	1.288E+00	4.607E-01	5.648E+00	9.375E-01	0.000E+00	1.961E-01	0.000E+00	0.000E+00	0.000E+00
10319760922	70674.19	1.365E+00	4.838E-01	6.070E+00	1.016E+00	0.000E+00	2.116E-01	0.000E+00	0.000E+00	0.000E+00
10319760928	33654.50	1.403E+00	4.952E-01	6.277E+00	1.055E+00	0.000E+00	2.199E-01	0.000E+00	0.000E+00	0.000E+00
10319761003	42163.00	1.449E+00	5.090E-01	6.531E+00	1.103E+00	0.000E+00	2.319E-01	0.000E+00	0.000E+00	0.000E+00
10319761012	0.00	1.449E+00	5.090E-01	6.531E+00	1.103E+00	0.000E+00	2.319E-01	0.000E+00	0.000E+00	0.000E+00
10319761019	24990.54	1.476E+00	5.183E-01	6.685E+00	1.130E+00	0.000E+00	2.401E-01	0.000E+00	0.000E+00	0.000E+00
10319761026	120833.13	1.608E+00	5.659E-01	7.446E+00	1.256E+00	0.000E+00	2.824E-01	0.000E+00	0.000E+00	0.000E+00
10319761102	71017.00	1.686E+00	5.969E-01	7.901E+00	1.331E+00	0.000E+00	3.103E-01	0.000E+00	0.000E+00	0.000E+00
10319761109	32568.52	1.721E+00	6.112E-01	8.100E+00	1.364E+00	0.000E+00	3.231E-01	0.000E+00	0.000E+00	0.000E+00
10319761115	26712.96	1.749E+00	6.228E-01	8.254E+00	1.389E+00	0.000E+00	3.342E-01	0.000E+00	0.000E+00	0.000E+00
10319761122	135796.00	1.889E+00	6.827E-01	9.011E+00	1.515E+00	0.000E+00	3.941E-01	0.000E+00	0.000E+00	0.000E+00
10319761130	140970.19	2.031E+00	7.443E-01	9.748E+00	1.641E+00	0.000E+00	4.588E-01	0.000E+00	0.000E+00	0.000E+00
10319761207	127139.06	2.156E+00	7.999E-01	1.037E+01	1.753E+00	0.000E+00	5.227E-01	0.000E+00	0.000E+00	0.000E+00
10319761214	361724.69	2.496E+00	9.581E-01	1.199E+01	2.053E+00	0.000E+00	6.730E-01	0.000E+00	0.000E+00	0.000E+00
10319761220	812964.13	3.248E+00	1.316E+00	1.528E+01	2.716E+00	0.000E+00	9.594E-01	0.000E+00	0.000E+00	0.000E+00
10319761229	436843.38	3.640E+00	1.507E+00	1.688E+01	3.059E+00	0.000E+00	1.084E+00	0.000E+00	0.000E+00	0.000E+00
10319770104	179989.94	3.797E+00	1.586E+00	1.743E+01	3.197E+00	0.000E+00	1.123E+00	7.870E-04	0.000E+00	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10319770119	616701.06	3.236E-02	9.430E-01	2.157E-01	6.729E+06	1.193E+08	2.464E-01	9.430E-02	3.863E-01	5.520E+00	1.915E+00
10319770128	255689.44	3.404E-02	1.615E+00	3.163E-01	1.053E+07	1.873E+08	3.203E-01	1.335E-01	4.920E-01	7.652E+00	2.451E+00
10319770131	60499.34	3.417E-02	1.839E+00	3.468E-01	1.191E+07	2.101E+08	3.325E-01	1.441E-01	5.172E-01	8.168E+00	2.591E+00
10319770207	113436.88	3.417E-02	2.137E+00	4.008E-01	1.281E+07	2.382E+08	3.796E-01	1.689E-01	5.529E-01	9.334E+00	2.846E+00
10319770216	115539.69	3.417E-02	2.213E+00	4.871E-01	4.147E+07	2.955E+08	3.958E-01	1.866E-01	5.761E-01	1.039E+01	3.061E+00
10319770224	78023.19	3.451E-02	2.383E+00	5.405E-01	5.834E+07	3.321E+08	4.295E-01	2.002E-01	5.879E-01	1.106E+01	3.199E+00
10319770302	110339.13	3.523E-02	2.769E+00	6.474E-01	7.914E+07	3.814E+08	4.787E-01	2.099E-01	6.142E-01	1.193E+01	3.916E+00
10319770310	292775.56	5.252E-02	3.282E+00	9.098E-01	1.416E+08	5.606E+08	5.683E-01	2.227E-01	7.934E-01	1.500E+01	4.594E+00
10319770318	423187.56	5.807E-02	3.837E+00	1.298E+00	2.465E+08	9.132E+08	6.775E-01	2.319E-01	1.080E+00	2.055E+01	5.575E+00
10319770323	229469.13	5.857E-02	8.402E+00	1.569E+00	2.843E+08	1.043E+09	7.226E-01	2.369E-01	1.208E+00	2.261E+01	6.112E+00
10319770401	234553.50	5.857E-02	9.222E+00	1.887E+00	3.108E+08	1.136E+09	7.801E-01	2.421E-01	1.335E+00	2.440E+01	6.655E+00
10319770406	56381.54	5.968E-02	9.457E+00	1.982E+00	3.120E+08	1.142E+09	7.939E-01	2.433E-01	1.356E+00	2.468E+01	6.761E+00
10319770413	55122.85	6.137E-02	9.662E+00	2.074E+00	3.127E+08	1.149E+09	8.209E-01	2.445E-01	1.370E+00	2.504E+01	6.866E+00
10319770420	41409.58	6.399E-02	9.725E+00	2.143E+00	3.127E+08	1.165E+09	8.493E-01	2.464E-01	1.377E+00	2.559E+01	6.941E+00
10319770427	39225.61	6.811E-02	9.794E+00	2.207E+00	3.316E+08	1.179E+09	8.644E-01	2.471E-01	1.383E+00	2.723E+01	7.005E+00
10319770504	32394.15	6.737E-02	9.942E+00	2.261E+00	3.627E+08	1.214E+09	9.007E-01	2.478E-01	1.387E+00	2.768E+01	7.063E+00
10319770511	333733.94	1.126E-01	1.045E+01	2.604E+00	6.342E+08	1.922E+09	1.034E+00	2.551E-01	1.492E+00	3.227E+01	7.676E+00
10319770519	75472.69	1.212E-01	1.052E+01	2.752E+00	6.844E+08	2.160E+09	1.068E+00	2.568E-01	1.520E+00	3.320E+01	7.836E+00
10319770526	702878.56	2.257E-01	1.405E+01	3.289E+00	1.311E+09	5.200E+09	1.425E+00	2.875E-01	1.785E+00	4.226E+01	8.850E+00
10319770601	1951027.00	3.323E-01	1.832E+01	4.569E+00	3.440E+09	1.565E+10	2.380E+00	5.434E-01	3.018E+00	7.298E+01	1.367E+01
10319770608	698099.75	3.827E-01	1.985E+01	5.210E+00	3.876E+09	1.913E+10	2.626E+00	5.740E-01	3.358E+00	8.366E+01	1.520E+01
10319770614	91049.25	3.859E-01	2.014E+01	5.324E+00	3.883E+09	1.955E+10	2.655E+00	5.760E-01	3.372E+00	8.501E+01	1.538E+01
10319770621	81137.69	3.859E-01	2.099E+01	5.386E+00	3.902E+09	1.971E+10	2.690E+00	5.860E-01	3.380E+00	8.594E+01	1.547E+01
10319770629	53590.93	4.027E-01	2.113E+01	5.451E+00	3.939E+09	1.980E+10	2.719E+00	5.872E-01	3.390E+00	8.681E+01	1.556E+01
10319770706	38951.67	4.029E-01	2.158E+01	5.496E+00	3.962E+09	1.988E+10	2.733E+00	5.906E-01	3.393E+00	8.731E+01	1.562E+01
10319770713	28794.79	4.029E-01	2.160E+01	5.528E+00	3.976E+09	1.994E+10	2.743E+00	5.912E-01	3.395E+00	8.768E+01	1.567E+01
10319770721	20349.55	4.029E-01	2.167E+01	5.554E+00	3.984E+09	1.999E+10	2.764E+00	5.921E-01	3.396E+00	8.797E+01	1.571E+01
10319770726	9902.83	4.030E-01	2.172E+01	5.568E+00	3.987E+09	2.001E+10	2.797E+00	5.923E-01	3.396E+00	8.813E+01	1.572E+01
10319770802	17710.34	4.044E-01	2.180E+01	5.600E+00	4.063E+09	2.011E+10	2.809E+00	5.927E-01	3.397E+00	8.841E+01	1.575E+01
10319770810	14241.70	4.062E-01	4.348E+01	5.632E+00	4.204E+09	2.023E+10	2.813E+00	5.930E-01	3.398E+00	8.862E+01	1.578E+01
10319770817	12154.39	4.062E-01	4.743E+01	5.666E+00	4.324E+09	2.037E+10	2.849E+00	5.949E-01	3.400E+00	8.907E+01	1.580E+01
10319770822	14738.25	4.076E-01	4.755E+01	5.689E+00	4.329E+09	2.052E+10	2.861E+00	5.962E-01	3.408E+00	8.939E+01	1.584E+01
10319770830	23581.19	4.078E-01	4.769E+01	5.724E+00	4.342E+09	2.075E+10	2.873E+00	5.967E-01	3.419E+00	8.966E+01	1.590E+01
10319770906	17997.57	4.079E-01	4.778E+01	5.749E+00	4.338E+09	2.093E+10	2.881E+00	5.971E-01	3.424E+00	8.983E+01	1.594E+01
10319770913	394634.44	4.130E-01	4.873E+01	6.146E+00	4.749E+09	2.238E+10	3.026E+00	6.057E-01	3.650E+00	9.501E+01	1.698E+01
10319770920	135578.38	4.148E-01	4.908E+01	6.398E+00	4.855E+09	2.308E+10	3.092E+00	6.087E-01	3.733E+00	9.685E+01	1.734E+01
10319770927	62138.62	4.148E-01	4.926E+01	6.484E+00	5.188E+09	2.335E+10	3.125E+00	6.108E-01	3.763E+00	9.742E+01	1.750E+01
10319771004	43183.38	4.148E-01	4.936E+01	6.523E+00	5.616E+09	2.398E+10	3.135E+00	6.110E-01	3.773E+00	9.791E+01	1.760E+01
10319771011	36070.87	4.148E-01	4.946E+01	6.541E+00	5.797E+09	2.416E+10	3.149E+00	6.110E-01	3.778E+00	9.831E+01	1.767E+01
1031977[illegible]8	391402.19	4.234E-01	5.006E+01	6.610E+00	5.830E+09	2.429E+10	3.278E+00	6.203E-01	3.983E+00	1.027E+02	1.864E+01
1031977[illegible]25	156974.06	4.268E-01	5.026E+01	6.682E+00	5.850E+09	2.434E+10	3.325E+00	6.230E-01	4.076E+00	1.043E+02	1.906E+01
10319771103	2332329.00	5.288E-01	5.230E+01	8.518E+00	6.244E+09	2.501E+10	3.998E+00	7.767E-01	5.758E+00	1.294E+02	2.437E+01
10319771108	1673112.00	5.764E-01	5.303E+01	1.013E+01	7.731E+09	2.611E+10	4.606E+00	8.865E-01	6.914E+00	1.474E+02	2.813E+01
10319771115	2652336.00	6.575E-01	8.435E+01	1.303E+01	1.115E+10	2.840E+10	6.066E+00	1.234E+00	1.102E+01	1.616E+02	3.509E+01
10319771122	183141.13	6.619E-01	8.631E+01	1.322E+01	1.138E+10	2.868E+10	6.131E+00	1.250E+00	1.113E+01	1.838E+02	3.586E+01
10319771129	273963.13	6.685E-01	8.661E+01	1.349E+01	1.170E+10	2.927E+10	6.215E+00	1.274E+00	1.127E+01	1.870E+02	3.620E+01
10319771206	169923.50	6.685E-01	8.776E+01	1.364E+01	1.183E+10	2.955E+10	6.266E+00	1.286E+00	1.137E+01	1.885E+02	3.661E+01
10319771212	163386.36	6.721E-01	8.808E+01	1.377E+01	1.193E+10	2.973E+10	6.362E+00	1.314E+00	1.152E+01	1.915E+02	3.726E+01
10319771220	531473.25	6.893E-01	8.866E+01	1.412E+01	1.222E+10	3.021E+10	6.512E+00	1.384E+00	1.169E+01	1.964E+02	3.807E+01
10319771230	711013.88	7.128E-01	8.882E+01	1.449E+01	1.264E+10	3.068E+10	6.686E+00	1.446E+00	1.209E+01	2.055E+02	3.966E+01
10319780105	580306.50	7.167E-01	8.945E+01	1.472E+01	1.302E+10	3.088E+10	7.005E+00	1.548E+00	1.244E+01	2.129E+02	4.094E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10319770119	616701.06	6.202E-01	3.910E-01	2.440E+00	4.854E-01	0.000E+00	3.371E-01	4.045E-03	5.393E-03	0.000E+00
10319770128	255699.44	8.885E-01	5.699E-01	3.536E+00	6.866E-01	0.000E+00	5.104E-01	5.722E-03	8.188E-03	0.000E+00
10319770131	60499.34	9.586E-01	6.202E-01	3.826E+00	7.369E-01	0.000E+00	5.646E-01	6.383E-03	9.246E-03	0.000E+00
10319770207	113436.88	1.095E+00	7.194E-01	4.391E+00	8.336E-01	0.000E+00	6.762E-01	7.871E-03	1.173E-02	0.000E+00
10319770216	115539.69	1.237E+00	8.052E-01	4.932E+00	9.246E-01	2.526E-04	7.772E-01	8.385E-02	1.349E-02	0.000E+00
10319770224	78023.19	1.335E+00	8.513E-01	5.268E+00	9.808E-01	5.938E-04	8.352E-01	1.234E-01	1.418E-02	0.000E+00
10319770302	110339.13	1.400E+00	9.044E-01	5.709E+00	1.056E+00	1.559E-03	9.052E-01	2.706E-01	1.490E-02	0.000E+00
10319770310	292775.50	1.826E+00	1.039E+00	6.855E+00	1.248E+00	3.479E-03	1.078E+00	5.746E-01	1.618E-02	0.000E+00
10319770318	423187.56	2.251E+00	1.224E+00	8.465E+00	1.525E+00	4.404E-03	1.300E+00	8.476E-01	1.711E-02	0.000E+00
10319770323	229469.13	2.447E+00	1.324E+00	9.313E+00	1.676E+00	4.404E-03	1.410E+00	9.053E-01	1.761E-02	0.000E+00
10319770401	234553.50	2.627E+00	1.427E+00	1.017E+01	1.830E+00	4.404E-03	1.518E+00	9.073E-01	1.863E-02	0.000E+00
10319770406	86381.84	2.678E+00	1.444E+00	1.038E+01	1.867E+00	4.404E-03	1.546E+00	9.078E-01	1.876E-02	0.000E+00
10319770413	55122.05	2.734E+00	1.457E+00	1.058E+01	1.903E+00	4.404E-03	1.575E+00	9.083E-01	1.888E-02	0.000E+00
10319770420	41409.58	2.781E+00	1.464E+00	1.073E+01	1.930E+00	4.404E-03	1.599E+00	9.087E-01	1.897E-02	0.000E+00
10319770427	39225.61	2.831E+00	1.466E+00	1.088E+01	1.956E+00	4.404E-03	1.623E+00	9.090E-01	1.905E-02	0.000E+00
10319770504	32394.15	2.877E+00	1.466E+00	1.100E+01	1.980E+00	4.404E-03	1.645E+00	9.093E-01	1.920E-02	0.000E+00
10319770511	333733.94	3.322E+00	1.510E+00	1.217E+01	2.213E+00	4.404E-03	1.849E+00	9.129E-01	2.065E-02	0.000E+00
10319770519	75472.69	3.417E+00	1.530E+00	1.241E+01	2.264E+00	4.404E-03	1.890E+00	9.139E-01	2.098E-02	0.000E+00
10319770526	702878.56	4.247E+00	1.822E+00	1.444E+01	2.725E+00	4.404E-03	2.229E+00	9.262E-01	2.559E-02	0.000E+00
10319770601	1951027.00	6.465E+00	2.931E+00	1.956E+01	4.048E+00	8.670E-03	3.082E+00	9.689E-01	4.266E-02	0.000E+00
10319770608	698099.75	7.274E+00	3.343E+00	2.166E+01	4.536E+00	8.670E-03	3.402E+00	9.826E-01	4.724E-02	0.000E+00
10319770614	91049.25	7.382E+00	3.399E+00	2.198E+01	4.604E+00	8.670E-03	3.446E+00	9.840E-01	4.763E-02	0.000E+00
10319770621	51137.89	7.443E+00	3.431E+00	2.218E+01	4.643E+00	8.670E-03	3.472E+00	9.847E-01	4.786E-02	0.000E+00
10319770629	33500.93	7.510E+00	3.467E+00	2.241E+01	4.686E+00	8.670E-03	3.501E+00	9.853E-01	4.809E-02	0.000E+00
10319770706	38951.67	7.562E+00	3.496E+00	2.260E+01	4.721E+00	8.670E-03	3.525E+00	9.857E-01	4.835E-02	0.000E+00
10319770713	28794.79	7.599E+00	3.516E+00	2.274E+01	4.740E+00	8.670E-03	3.544E+00	9.860E-01	4.854E-02	0.000E+00
10319770721	20349.55	7.624E+00	3.530E+00	2.285E+01	4.767E+00	8.670E-03	3.559E+00	9.862E-01	4.867E-02	0.000E+00
10319770726	9902.83	7.636E+00	3.536E+00	2.290E+01	4.777E+00	8.691E-03	3.567E+00	9.864E-01	4.876E-02	0.000E+00
10319770802	17710.34	7.657E+00	3.546E+00	2.299E+01	4.796E+00	8.769E-03	3.583E+00	9.866E-01	4.895E-02	0.000E+00
10319770810	14241.70	7.673E+00	3.555E+00	2.306E+01	4.810E+00	8.800E-03	3.594E+00	9.868E-01	4.907E-02	0.000E+00
10319770817	12154.39	7.686E+00	3.563E+00	2.312E+01	4.821E+00	8.800E-03	3.602E+00	9.869E-01	4.915E-02	0.000E+00
10319770822	14738.25	7.702E+00	3.572E+00	2.318E+01	4.833E+00	8.800E-03	3.609E+00	9.869E-01	4.922E-02	0.000E+00
10319770830	23581.19	7.725E+00	3.588E+00	2.328E+01	4.853E+00	8.800E-03	3.620E+00	9.869E-01	4.932E-02	0.000E+00
10319770906	17997.57	7.743E+00	3.601E+00	2.335E+01	4.866E+00	8.800E-03	3.625E+00	9.869E-01	4.944E-02	0.000E+00
10319770913	394634.44	8.347E+00	3.619E+00	2.460E+01	5.160E+00	1.053E-02	3.746E+00	9.886E-01	5.116E-02	0.000E+00
10319770920	135578.38	8.554E+00	3.636E+00	2.505E+01	5.260E+00	1.082E-02	3.791E+00	9.889E-01	5.176E-02	0.000E+00
10319770927	62138.62	8.649E+00	3.650E+00	2.527E+01	5.307E+00	1.082E-02	3.812E+00	9.889E-01	5.203E-02	0.000E+00
10319771004	43183.38	8.716E+00	3.664E+00	2.543E+01	5.341E+00	1.082E-02	3.830E+00	9.889E-01	5.241E-02	0.000E+00
10319771011	36070.87	8.769E+00	3.673E+00	2.555E+01	5.367E+00	1.082E-02	3.845E+00	9.890E-01	5.272E-02	0.000E+00
10319771018	391402.19	9.334E+00	3.733E+00	2.669E+01	5.623E+00	1.160E-02	3.981E+00	9.907E-01	5.615E-02	0.000E+00
10319771025	156974.06	9.554E+00	3.743E+00	2.708E+01	5.716E+00	1.202E-02	4.033E+00	9.917E-01	5.752E-02	0.000E+00
10319771103	2332329.00	1.277E+01	3.743E+00	3.193E+01	6.991E+00	2.732E-02	4.798E+00	1.017E+00	8.301E-02	0.000E+00
10319771108	1673112.00	1.470E+01	3.743E+00	3.456E+01	7.722E+00	3.463E-02	5.310E+00	1.032E+00	9.399E-02	0.000E+00
10319771115	2652336.00	1.743E+01	3.743E+00	3.798E+01	8.708E+00	4.043E-02	6.064E+00	1.049E+00	1.056E-01	0.000E+00
10319771122	183141.13	1.759E+01	3.743E+00	3.815E+01	8.764E+00	4.083E-02	6.116E+00	1.050E+00	1.060E-01	0.000E+00
10319771129	273963.13	1.770E+01	3.743E+00	3.829E+01	8.830E+00	4.203E-02	6.194E+00	1.051E+00	1.066E-01	0.000E+00
10319771206	169923.50	1.799E+01	3.743E+00	3.868E+01	8.901E+00	4.203E-02	6.253E+00	1.052E+00	1.073E-01	0.000E+00
10319771212	163386.56	1.820E+01	3.743E+00	3.907E+01	8.979E+00	4.203E-02	6.325E+00	1.053E+00	1.080E-01	0.000E+00
10319771220	831473.25	1.890E+01	3.743E+00	4.034E+01	9.238E+00	4.203E-02	6.603E+00	1.055E+00	1.104E-01	0.000E+00
10319771230	711013.88	1.987E+01	3.743E+00	4.212E+01	9.693E+00	4.203E-02	7.054E+00	1.060E+00	1.150E-01	0.000E+00
10319780105	680306.50	2.069E+01	3.743E+00	4.364E+01	1.011E+01	4.437E-02	7.511E+00	1.067E+00	1.226E-01	0.000E+00

All Mn values on this page from 3-23 are high by .8782.

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	DOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10319780110	372341.50	0.000E+00	7.326E-01	1.302E-01	2.017E+08	3.003E+08	1.302E-01	2.442E-02	2.344E-01	4.477E+00	7.978E-01
10319780117	783405.13	2.398E-02	1.418E+00	3.872E-01	5.591E+08	1.233E+09	2.399E-01	9.293E-02	7.483E-01	1.355E+01	2.459E+00
10319780124	2706238.00	1.837E-01	4.968E+00	1.215E+00	1.781E+09	5.796E+09	8.315E-01	3.296E-01	2.417E+00	3.840E+01	7.547E+00
10319780131	526838.38	2.298E-01	5.889E+00	1.377E+00	2.016E+09	6.946E+09	9.893E-01	3.757E-01	2.721E+00	4.209E+01	8.423E+00
10319780207	205669.56	2.446E-01	6.519E+00	1.444E+00	2.110E+09	7.344E+09	1.065E+00	3.937E-01	2.849E+00	4.402E+01	8.841E+00
10319780216	97400.00	2.453E-01	6.604E+00	1.480E+00	2.155E+09	7.508E+09	1.092E+00	4.064E-01	2.880E+00	4.460E+01	8.999E+00
10319780224	432566.31	2.510E-01	7.171E+00	1.622E+00	2.343E+09	8.040E+09	1.227E+00	4.632E-01	3.051E+00	4.706E+01	9.755E+00
10319780228	254517.88	2.565E-01	9.564E+00	1.706E+00	2.446E+09	8.250E+09	1.302E+00	4.799E-01	3.170E+00	4.850E+01	1.019E+01
10319780308	1425469.00	3.157E-01	1.112E+01	2.142E+00	2.903E+09	9.367E+09	1.590E+00	5.734E-01	3.949E+00	5.692E+01	1.327E+01
10319780314	391770.25	3.354E-01	1.138E+01	2.262E+00	2.962E+09	9.643E+09	1.682E+00	5.819E-01	4.181E+00	5.949E+01	1.404E+01
10319780321	178921.19	3.378E-01	1.157E+01	2.328E+00	2.990E+09	9.737E+09	1.750E+00	5.898E-01	4.277E+00	6.133E+01	1.436E+01
10319780329	257028.44	3.423E-01	1.186E+01	2.446E+00	3.033E+09	9.821E+09	1.832E+00	6.966E-01	4.390E+00	6.414E+01	1.484E+01
10319780405	132786.06	3.440E-01	1.223E+01	2.528E+00	3.051E+09	9.874E+09	1.910E+00	6.327E-01	4.437E+00	6.565E+01	1.512E+01
10319780412	55977.84	3.449E-01	1.248E+01	2.569E+00	3.057E+09	9.900E+09	1.936E+00	6.413E-01	4.478E+00	6.646E+01	1.522E+01
10319780419	100619.00	3.471E-01	1.309E+01	2.662E+00	3.065E+09	9.953E+09	1.971E+00	6.645E-01	4.505E+00	6.736E+01	1.537E+01
10319780425	170797.25	3.486E-01	1.369E+01	2.800E+00	3.094E+09	1.005E+10	2.040E+00	6.881E-01	4.545E+00	6.871E+01	1.565E+01
10319780427	973532.75	5.508E-01	1.561E+01	3.502E+00	3.337E+09	1.067E+10	2.321E+00	7.945E-01	5.026E+00	7.978E+01	1.680E+01
10319780502	1045096.63	7.244E-01	1.721E+01	4.256E+00	3.627E+09	1.136E+10	2.769E+00	1.000E+00	5.595E+00	9.074E+01	1.812E+01
10319780510	1422941.00	7.586E-01	1.907E+01	5.563E+00	4.011E+09	1.302E+10	3.214E+00	1.062E+00	6.289E+00	1.038E+02	2.002E+01
10319780516	691923.81	7.632E-01	1.953E+01	6.425E+00	4.190E+09	1.439E+10	3.426E+00	1.078E+00	6.635E+00	1.121E+02	2.118E+01
10319780522	231285.38	7.692E-01	2.008E+01	6.633E+00	4.223E+09	1.474E+10	3.532E+00	1.093E+00	6.752E+00	1.148E+02	2.148E+01
10319780529	89130.31	7.698E-01	2.061E+01	6.685E+00	4.226E+09	1.484E+10	3.567E+00	1.097E+00	6.790E+00	1.158E+02	2.163E+01
10319780606	340653.50	7.728E-01	2.150E+01	6.901E+00	4.239E+09	1.531E+10	3.770E+00	1.171E+00	6.903E+00	1.217E+02	2.203E+01
10319780614	340653.50	7.810E-01	2.426E+01	7.139E+00	4.256E+09	1.588E+10	3.932E+00	1.193E+00	7.053E+00	1.286E+02	2.242E+01
10319780620	102617.25	7.812E-01	2.442E+01	7.229E+00	4.272E+09	1.607E+10	3.971E+00	1.198E+00	7.093E+00	1.303E+02	2.258E+01
10319780628	87352.44	7.818E-01	2.487E+01	7.319E+00	4.294E+09	1.623E+10	4.010E+00	1.206E+00	7.121E+00	1.318E+02	2.270E+01
10319780705	47440.23	7.825E-01	2.501E+01	7.394E+00	4.367E+09	1.635E+10	4.051E+00	1.213E+00	7.137E+00	1.328E+02	2.279E+01
10319780712	34299.21	7.829E-01	2.525E+01	7.465E+00	4.459E+09	1.644E+10	4.096E+00	1.223E+00	7.156E+00	1.335E+02	2.285E+01
10319780718	32643.54	7.830E-01	2.533E+01	7.565E+00	4.603E+09	1.662E+10	4.110E+00	1.225E+00	7.158E+00	1.338E+02	2.290E+01
10319780726	46997.48	7.831E-01	2.641E+01	7.750E+00	4.878E+09	1.690E+10	4.123E+00	1.228E+00	7.161E+00	1.343E+02	2.297E+01
10319780801	59416.23	7.832E-01	2.666E+01	7.922E+00	5.054E+09	1.741E+10	4.146E+00	1.231E+00	7.166E+00	1.350E+02	2.305E+01
10319780808	77947.06	7.931E-01	2.697E+01	8.067E+00	5.059E+09	1.794E+10	4.201E+00	1.233E+00	7.174E+00	1.359E+02	2.316E+01
10319780814	672243.80	8.151E-01	2.814E+01	9.287E+00	8.670E+09	2.222E+10	4.483E+00	1.262E+00	7.413E+00	1.471E+02	2.337E+01
10319780823	826326.81	8.187E-01	3.103E+01	1.079E+01	1.687E+10	2.722E+10	4.966E+00	1.335E+00	7.766E+00	1.603E+02	2.544E+01
10319780829	65608.25	8.192E-01	3.129E+01	1.090E+01	1.722E+10	2.738E+10	4.996E+00	1.338E+00	7.784E+00	1.612E+02	2.556E+01
10319780905	50457.82	8.192E-01	3.155E+01	1.098E+01	1.734E+10	2.739E+10	5.017E+00	1.339E+00	7.791E+00	1.612E+02	2.565E+01
10319780912	31533.82	8.192E-01	3.164E+01	1.103E+01	1.744E+10	2.745E+10	5.030E+00	1.340E+00	7.795E+00	1.612E+02	2.572E+01
10319780919	23628.64	8.196E-01	3.170E+01	1.106E+01	1.753E+10	2.755E+10	5.037E+00	1.341E+00	7.797E+00	1.612E+02	2.577E+01
10319780926	17617.50	8.208E-01	3.173E+01	1.109E+01	1.757E+10	2.767E+10	5.046E+00	1.342E+00	7.798E+00	1.612E+02	2.581E+01
10319781003	24067.98	8.244E-01	3.182E+01	1.112E+01	1.758E+10	2.791E+10	5.062E+00	1.343E+00	7.801E+00	1.612E+02	2.586E+01
10319781010	28235.28	8.294E-01	3.187E+01	1.117E+01	1.759E+10	2.807E+10	5.080E+00	1.343E+00	7.804E+00	1.612E+02	2.591E+01
10319781017	19156.25	8.296E-01	3.196E+01	1.120E+01	1.759E+10	2.809E+10	5.086E+00	1.344E+00	7.804E+00	1.612E+02	2.595E+01
10319781025	18252.22	8.297E-01	3.200E+01	1.123E+01	1.761E+10	2.814E+10	5.092E+00	1.344E+00	7.804E+00	1.612E+02	2.599E+01
10319781031	10232.32	8.297E-01	3.203E+01	1.124E+01	1.763E+10	2.818E+10	5.101E+00	1.344E+00	7.805E+00	1.612E+02	2.601E+01
10319781109	13929.60	8.298E-01	3.210E+01	1.126E+01	1.765E+10	2.822E+10	5.108E+00	1.345E+00	7.806E+00	1.612E+02	2.604E+01
10319781114	18518.60	8.301E-01	3.218E+01	1.129E+01	1.765E+10	2.823E+10	5.120E+00	1.345E+00	7.807E+00	1.612E+02	2.607E+01
10319781121	20646.80	8.301E-01	3.222E+01	1.133E+01	1.766E+10	2.824E+10	5.131E+00	1.345E+00	7.808E+00	1.612E+02	2.612E+01
10319781128	19984.42	8.301E-01	3.236E+01	1.137E+01	1.766E+10	2.826E+10	5.136E+00	1.346E+00	7.809E+00	1.612E+02	2.615E+01
10319781205	208604.81	8.373E-01	3.336E+01	1.163E+01	1.770E+10	2.842E+10	5.311E+00	1.364E+00	7.874E+00	1.612E+02	2.657E+01
10319781213	231040.75	8.506E-01	3.351E+01	1.174E+01	1.777E+10	2.863E+10	5.773E+00	1.379E+00	7.949E+00	1.612E+02	2.703E+01
10319781219	78168.56	8.593E-01	3.385E+01	1.177E+01	1.779E+10	2.868E+10	5.811E+00	1.400E+00	7.973E+00	1.612E+02	2.718E+01
10319781228	352244.75	8.655E-01	3.439E+01	1.191E+01	1.785E+10	2.881E+10	5.932E+00	1.446E+00	8.080E+00	1.612E+02	2.790E+01
10319790104	1604400.00	9.076E-01	4.211E+01	1.240E+01	1.826E+10	2.961E+10	6.265E+00	1.586E+00	8.704E+00	1.612E+02	3.137E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10319780110	372341.50	5.210E-01	0.000E+00	9.036E-01	2.524E-01	8.140E-04	2.524E-01	4.070E-03	4.070E-03	0.000E+00
10319780117	783405.13	1.617E+00	0.000E+00	2.685E+00	7.491E-01	2.527E-03	7.148E-01	1.092E-02	1.092E-02	0.000E+00
10319780124	2706238.00	5.404E+00	0.000E+00	8.247E+00	2.287E+00	8.443E-03	1.957E+00	2.867E-02	2.867E-02	0.000E+00
10319780131	526838.38	6.141E+00	0.000E+00	9.214E+00	2.564E+00	9.595E-03	2.142E+00	3.097E-02	3.097E-02	0.000E+00
10319780207	205669.56	6.429E+00	0.000E+00	9.551E+00	2.667E+00	1.049E-02	2.196E+00	3.187E-02	3.232E-02	0.000E+00
10319780216	97400.00	6.554E+00	4.259E-03	9.715E+00	2.714E+00	1.092E-02	2.219E+00	3.230E-02	3.275E-02	0.000E+00
10319780224	432566.31	7.056E+00	5.154E-02	1.046E+01	2.913E+00	1.281E-02	2.314E+00	3.419E-02	3.370E-02	0.000E+00
10319780228	254517.88	7.317E+00	9.606E-02	1.092E+01	3.024E+00	1.392E-02	2.364E+00	3.530E-02	3.425E-02	0.000E+00
10319780308	1425469.00	8.720E+00	4.389E-01	1.354E+01	3.678E+00	2.327E-02	2.644E+00	4.465E-02	4.048E-02	0.000E+00
10319780314	391770.25	9.148E+00	4.988E-01	1.438E+01	3.884E+00	2.499E-02	2.773E+00	4.722E-02	4.305E-02	0.000E+00
10319780321	178921.19	9.359E+00	5.184E-01	1.480E+01	3.986E+00	2.538E-02	2.847E+00	4.840E-02	4.462E-02	0.000E+00
10319780329	257028.44	9.691E+00	5.296E-01	1.547E+01	4.143E+00	2.538E-02	2.982E+00	5.008E-02	4.799E-02	0.000E+00
10319780405	132786.00	9.879E+00	5.296E-01	1.586E+01	4.236E+00	2.538E-02	3.072E+00	5.153E-02	5.960E-02	0.000E+00
10319780412	55977.84	9.955E+00	5.296E-01	1.601E+01	4.271E+00	2.538E-02	3.107E+00	5.202E-02	5.158E-02	0.000E+00
10319780419	100619.00	1.008E+01	5.296E-01	1.623E+01	4.329E+00	2.538E-02	3.167E+00	5.268E-02	5.312E-02	0.000E+00
10319780425	170797.25	1.030E+01	5.296E-01	1.653E+01	4.415E+00	2.538E-02	3.260E+00	5.343E-02	5.536E-02	0.000E+00
10319780427	973532.75	1.147E+01	5.296E-01	1.791E+01	4.840E+00	2.538E-02	3.750E+00	5.769E-02	6.601E-02	0.000E+00
10319780502	1045096.63	1.273E+01	5.296E-01	1.931E+01	5.297E+00	2.766E-02	4.252E+00	6.454E-02	7.743E-02	0.000E+00
10319780510	1422941.00	1.437E+01	5.296E-01	2.136E+01	5.919E+00	3.077E-02	4.986E+00	7.076E-02	8.987E-02	0.000E+00
10319780516	691923.81	1.515E+01	5.296E-01	2.249E+01	6.222E+00	3.229E-02	5.208E+00	7.225E-02	9.441E-02	0.000E+00
10319780522	231285.38	1.540E+01	5.296E-01	2.291E+01	6.323E+00	3.279E-02	5.304E+00	7.278E-02	9.542E-02	0.000E+00
10319780529	89130.31	1.549E+01	5.296E-01	2.308E+01	6.364E+00	3.299E-02	5.339E+00	7.298E-02	9.562E-02	0.000E+00
10319780606	340653.50	1.585E+01	5.296E-01	2.381E+01	6.535E+00	3.373E-02	5.473E+00	7.447E-02	9.711E-02	0.000E+00
10319780614	349653.50	1.621E+01	5.296E-01	2.458E+01	6.714E+00	3.373E-02	5.630E+00	7.596E-02	9.860E-02	0.000E+00
10319780620	102617.25	1.632E+01	5.296E-01	2.482E+01	6.772E+00	3.373E-02	5.684E+00	7.641E-02	9.905E-02	0.000E+00
10319780628	87352.44	1.641E+01	5.296E-01	2.503E+01	6.824E+00	3.373E-02	5.735E+00	7.679E-02	9.943E-02	0.000E+00
10319780705	47440.23	1.646E+01	5.296E-01	2.515E+01	6.855E+00	3.373E-02	5.768E+00	7.720E-02	9.974E-02	0.000E+00
10319780712	34299.21	1.649E+01	5.296E-01	2.524E+01	6.875E+00	3.373E-02	5.787E+00	7.743E-02	9.989E-02	0.000E+00
10319780718	32843.54	1.652E+01	5.296E-01	2.531E+01	6.893E+00	3.373E-02	5.801E+00	7.757E-02	9.996E-02	0.000E+00
10319780725	46997.48	1.655E+01	5.296E-01	2.541E+01	6.917E+00	3.373E-02	5.814E+00	7.767E-02	1.001E-01	0.000E+00
10319780801	59416.23	1.659E+01	5.296E-01	2.554E+01	6.945E+00	3.386E-02	5.824E+00	7.793E-02	1.002E-01	0.000E+00
10319780808	77947.06	1.666E+01	5.808E-01	2.571E+01	6.985E+00	3.386E-02	5.838E+00	7.810E-02	1.004E-01	0.000E+00
10319780814	672243.50	1.739E+01	1.477E+00	2.726E+01	7.337E+00	3.386E-02	5.970E+00	7.957E-02	1.010E-01	0.000E+00
10319780823	826326.81	1.844E+01	3.049E+00	2.927E+01	7.789E+00	3.386E-02	6.151E+00	8.138E-02	1.036E-01	0.000E+00
10319780829	65608.25	1.854E+01	3.231E+00	2.944E+01	7.829E+00	3.386E-02	6.167E+00	8.152E-02	1.039E-01	0.000E+00
10319780905	50437.82	1.863E+01	3.402E+00	2.958E+01	7.863E+00	3.386E-02	6.101E+00	8.174E-02	1.043E-01	0.000E+00
10319780912	31533.82	1.868E+01	3.484E+00	2.966E+01	7.881E+00	3.386E-02	6.190E+00	8.188E-02	1.044E-01	0.000E+00
10319780919	23628.64	1.872E+01	3.525E+00	2.971E+01	7.891E+00	3.386E-02	6.197E+00	8.199E-02	1.045E-01	0.000E+00
10319780926	17617.50	1.874E+01	3.543E+00	2.974E+01	7.897E+00	3.386E-02	6.202E+00	8.206E-02	1.046E-01	0.000E+00
10319781003	24067.98	1.876E+01	3.548E+00	2.977E+01	7.902E+00	3.391E-02	6.210E+00	8.227E-02	1.047E-01	0.000E+00
10319781010	28235.28	1.879E+01	3.555E+00	2.982E+01	7.909E+00	3.391E-02	6.220E+00	8.252E-02	1.049E-01	0.000E+00
10319781017	19156.25	1.881E+01	3.560E+00	2.985E+01	7.915E+00	3.391E-02	6.227E+00	8.269E-02	1.049E-01	0.000E+00
10319781025	10252.22	1.883E+01	3.565E+00	2.989E+01	7.922E+00	3.391E-02	6.234E+00	8.285E-02	1.049E-01	0.000E+00
10319781031	10232.32	1.884E+01	3.568E+00	2.991E+01	7.926E+00	3.391E-02	6.239E+00	8.294E-02	1.049E-01	0.000E+00
10319781109	13929.60	1.886E+01	3.573E+00	2.993E+01	7.932E+00	3.391E-02	6.245E+00	8.306E-02	1.049E-01	0.000E+00
10319781114	18518.60	1.888E+01	3.579E+00	2.990E+01	7.942E+00	3.391E-02	6.253E+00	8.322E-02	1.049E-01	0.000E+00
10319781121	20646.80	1.890E+01	3.587E+00	3.002E+01	7.954E+00	3.391E-02	6.263E+00	8.340E-02	1.049E-01	0.000E+00
10319781128	19984.42	1.892E+01	3.595E+00	3.007E+01	7.966E+00	3.391E-02	6.274E+00	8.358E-02	1.049E-01	0.000E+00
10319781205	200604.81	1.914E+01	3.686E+00	3.061E+01	8.112E+00	3.391E-02	6.392E+00	8.586E-02	1.049E-01	0.000E+00
10319781213	231840.75	1.940E+01	3.782E+00	3.117E+01	8.259E+00	3.391E-02	6.504E+00	8.788E-02	1.049E-01	0.000E+00
10319781219	78168.56	1.948E+01	3.813E+00	3.134E+01	8.304E+00	3.391E-02	6.534E+00	8.840E-02	1.049E-01	0.000E+00
10319781228	352244.75	1.988E+01	3.952E+00	3.205E+01	8.489E+00	3.391E-02	6.650E+00	8.994E-02	1.049E-01	0.000E+00
10319790104	1604400.00	2.101E+01	4.583E+00	3.500E+01	9.260E+00	3.742E-02	7.036E+00	9.695E-02	1.084E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10319790116	1558277.00	9.539E-02	2.044E+00	4.429E-01	5.565E+08	1.175E+09	5.996E-01	1.022E-01	7.393E-01	0.000E+00	2.930E+00
10319790123	671923.69	1.395E-01	4.680E+00	6.632E-01	8.164E+06	1.841E+09	8.963E-01	2.197E-01	1.055E+00	0.000E+00	4.281E+00
10319790130	560902.13	1.432E-01	6.554E+00	8.249E-01	1.773E+09	3.478E+09	1.046E+00	2.446E-01	1.295E+00	0.000E+00	5.463E+00
10319790206	151298.69	1.432E-01	7.480E+00	8.613E-01	2.223E+09	4.198E+09	1.116E+00	2.570E-01	1.351E+00	0.000E+00	5.771E+00
10319790213	225204.06	1.466E-01	8.022E+00	9.303E-01	2.714E+09	4.985E+09	1.189E+00	2.825E-01	1.434E+00	0.000E+00	6.248E+00
10319790222	459660.31	1.557E-01	1.194E+01	1.101E+00	3.352E+09	6.008E+09	1.319E+00	3.026E-01	1.589E+00	0.000E+00	7.032E+00
10319790227	1613143.00	2.121E-01	2.287E+01	1.842E+00	3.944E+09	6.968E+09	1.883E+00	3.378E-01	2.234E+00	0.000E+00	9.818E+00
10319790307	731390.75	2.137E-01	2.399E+01	2.225E+00	4.500E+09	7.877E+09	2.097E+00	3.538E-01	2.513E+00	0.000E+00	1.115E+01
10319790313	664075.63	2.137E-01	2.428E+01	2.647E+00	5.422E+09	9.392E+09	2.325E+00	3.683E-01	2.780E+00	0.000E+00	1.238E+01
10319790320	276649.81	2.173E-01	2.453E+01	2.870E+00	6.895E+09	1.100E+10	2.370E+00	3.744E-01	2.876E+00	0.000E+00	1.295E+01
10319790327	133264.81	2.179E-01	2.493E+01	3.010E+00	8.217E+09	1.232E+10	2.402E+00	3.773E-01	2.910E+00	0.000E+00	1.320E+01
10319790405	140634.75	2.192E-01	2.613E+01	3.145E+00	9.099E+09	1.330E+10	2.444E+00	3.804E-01	2.943E+00	0.000E+00	1.349E+01
10319790411	195652.81	2.192E-01	2.656E+01	3.317E+00	9.410E+09	1.392E+10	2.627E+00	3.846E-01	3.006E+00	0.000E+00	1.381E+01
10319790417	413180.50	2.192E-01	2.855E+01	3.651E+00	9.916E+09	1.509E+10	2.643E+00	3.937E-01	3.130E+00	0.000E+00	1.443E+01
10319790424	245719.00	2.192E-01	2.909E+01	3.839E+00	1.013E+10	1.570E+10	2.705E+00	3.990E-01	3.204E+00	0.000E+00	1.484E+01
10319790501	286758.56	2.217E-01	2.959E+01	4.058E+00	1.029E+10	1.627E+10	2.777E+00	4.053E-01	3.286E+00	0.000E+00	1.523E+01
10319790509	227534.44	2.231E-01	3.103E+01	4.237E+00	1.036E+10	1.661E+10	2.850E+00	4.103E-01	3.347E+00	0.000E+00	1.558E+01
10319790516	223788.31	2.310E-01	3.142E+01	4.409E+00	1.158E+10	1.794E+10	2.983E+00	4.152E-01	3.417E+00	0.000E+00	1.589E+01
10319790522	379883.25	2.318E-01	3.209E+01	4.699E+00	1.634E+10	2.171E+10	3.125E+00	4.235E-01	3.567E+00	0.000E+00	1.643E+01
10319790529	480125.50	2.350E-01	3.272E+01	5.109E+00	1.819E+10	2.480E+10	3.287E+00	4.340E-01	3.736E+00	0.000E+00	1.709E+01
10319790606	474992.19	2.381E-01	3.469E+01	5.566E+00	1.881E+10	2.594E+10	3.482E+00	4.444E-01	3.921E+00	0.000E+00	1.776E+01
10319790612	149156.88	2.388E-01	3.583E+01	5.686E+00	1.903E+10	2.633E+10	3.619E+00	5.031E-01	3.968E+00	0.000E+00	1.798E+01
10319790619	121684.81	2.396E-01	3.615E+01	5.771E+00	1.924E+10	2.667E+10	3.662E+00	5.084E-01	3.995E+00	0.000E+00	1.816E+01
10319790626	85466.00	2.397E-01	3.645E+01	5.844E+00	1.940E+10	2.693E+10	3.698E+00	5.140E-01	4.010E+00	0.000E+00	1.830E+01
10319790703	158839.56	2.401E-01	3.735E+01	6.007E+00	1.973E+10	2.745E+10	3.788E+00	5.557E-01	4.032E+00	0.000E+00	1.857E+01
10319790710	90911.94	2.417E-01	3.763E+01	6.119E+00	1.994E+10	2.776E+10	3.829E+00	5.577E-01	4.050E+00	0.000E+00	1.872E+01
10319790717	52903.02	2.420E-01	3.763E+01	6.188E+00	2.026E+10	2.791E+10	3.849E+00	5.600E-01	4.055E+00	0.000E+00	1.880E+01
10319790723	135522.38	2.456E-01	3.810E+01	6.381E+00	2.160E+10	2.822E+10	3.909E+00	5.689E-01	4.080E+00	0.000E+00	1.899E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10319790116	1558277.00	1.465E+00	3.748E-01	1.840E+00	5.110E-01	3.407E-03	2.725E-01	3.407E-03	3.407E-03	0.000E+00
10319790123	671923.69	1.994E+00	4.776E-01	2.383E+00	6.726E-01	4.876E-03	3.607E-01	3.407E-03	4.876E-03	0.000E+00
10319790130	560902.13	2.334E+00	5.149E-01	2.632E+00	7.597E-01	6.120E-03	4.104E-01	3.407E-03	6.120E-03	0.000E+00
10319790206	151298.69	2.434E+00	5.149E-01	2.645E+00	7.762E-01	6.781E-03	4.204E-01	3.407E-03	6.781E-03	0.000E+00
10319790213	225204.06	2.577E+00	5.198E-01	2.724E+00	8.156E-01	7.274E-03	4.401E-01	3.407E-03	7.274E-03	0.000E+00
10319790222	459660.31	2.918E+00	5.399E-01	3.005E+00	9.161E-01	7.274E-03	4.903E-01	3.407E-03	7.274E-03	0.000E+00
10319790227	1613143.00	4.364E+00	6.457E-01	4.537E+00	1.410E+00	7.274E-03	7.725E-01	6.934E-03	7.274E-03	0.000E+00
10319790307	731390.75	5.084E+00	7.257E-01	5.421E+00	1.682E+00	7.274E-03	9.324E-01	1.013E-02	7.274E-03	0.000E+00
10319790313	664075.63	5.752E+00	7.692E-01	6.364E+00	1.958E+00	7.274E-03	1.107E+00	1.168E-02	7.274E-03	0.000E+00
10319790320	276649.81	6.036E+00	7.813E-01	6.812E+00	2.079E+00	7.274E-03	1.185E+00	1.219E-02	7.274E-03	0.000E+00
10319790327	133264.81	6.176E+00	7.842E-01	7.057E+00	2.140E+00	7.274E-03	1.229E+00	1.248E-02	7.274E-03	0.000E+00
10319790405	140634.75	6.330E+00	7.842E-01	7.349E+00	2.214E+00	7.274E-03	1.284E+00	1.309E-02	7.274E-03	0.000E+00
10319790411	195652.81	6.539E+00	7.885E-01	7.747E+00	2.308E+00	7.274E-03	1.357E+00	1.395E-02	7.274E-03	0.000E+00
10319790417	413188.50	6.982E+00	7.976E-01	8.569E+00	2.497E+00	7.274E-03	1.502E+00	1.576E-02	7.274E-03	0.000E+00
10319790424	245719.00	7.245E+00	8.083E-01	9.052E+00	2.605E+00	7.274E-03	1.582E+00	1.683E-02	7.274E-03	0.000E+00
10319790501	286758.56	7.552E+00	8.334E-01	9.610E+00	2.730E+00	8.527E-03	1.682E+00	1.871E-02	7.274E-03	0.000E+00
10319790509	227534.44	7.796E+00	8.533E-01	1.007E+01	2.830E+00	9.025E-03	1.762E+00	1.971E-02	7.274E-03	0.000E+00
10319790516	223788.31	8.036E+00	8.728E-01	1.055E+01	2.927E+00	9.514E-03	1.840E+00	2.020E-02	7.274E-03	0.000E+00
10319790522	379883.25	8.443E+00	9.061E-01	1.139E+01	3.094E+00	1.034E-02	1.973E+00	2.103E-02	7.274E-03	0.000E+00
10319790529	480125.50	8.957E+00	9.481E-01	1.248E+01	3.304E+00	1.139E-02	2.141E+00	2.208E-02	7.274E-03	0.000E+00
10319790606	474992.19	9.466E+00	9.896E-01	1.360E+01	3.511E+00	1.243E-02	2.307E+00	2.312E-02	7.274E-03	0.000E+00
10319790612	149156.88	9.626E+00	1.003E+00	1.396E+01	3.580E+00	1.276E-02	2.363E+00	2.344E-02	7.274E-03	0.000E+00
10319790619	121684.81	9.756E+00	1.013E+00	1.427E+01	3.636E+00	1.303E-02	2.408E+00	2.371E-02	7.274E-03	0.000E+00
10319790626	85466.00	9.850E+00	1.021E+00	1.449E+01	3.677E+00	1.321E-02	2.442E+00	2.389E-02	7.274E-03	0.000E+00
10319790703	158839.56	1.003E+01	1.035E+00	1.492E+01	3.757E+00	1.356E-02	2.508E+00	2.424E-02	7.621E-03	0.000E+00
10319790710	90911.94	1.013E+01	1.043E+00	1.517E+01	3.804E+00	1.376E-02	2.547E+00	2.444E-02	8.018E-03	0.000E+00
10319790717	52903.02	1.019E+01	1.047E+00	1.533E+01	3.833E+00	1.387E-02	2.572E+00	2.456E-02	8.365E-03	0.000E+00
10319790723	135522.38	1.035E+01	1.059E+00	1.573E+01	3.910E+00	1.417E-02	2.637E+00	2.485E-02	9.551E-03	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	F	TOC	CL
10419760714	565432.63	1.236E-03	1.731E+00	3.832E-01	0.000E+00	2.973E+07	1.211E-01	1.236E-02	4.945E-03	6.923E+00	4.203E-01
10419760721	414979.44	1.236E-03	2.630E+00	6.191E-01	4.116E+05	6.307E+07	2.255E-01	1.236E-02	9.481E-03	1.237E+01	7.832E-01
10419760727	311532.00	1.236E-03	3.047E+00	7.758E-01	1.030E+06	9.706E+07	3.154E-01	1.917E-02	1.357E-02	1.679E+01	1.110E+00
10419760803	179052.31	1.236E-03	3.731E+00	8.815E-01	2.806E+06	1.214E+08	3.569E-01	2.309E-02	1.592E-02	1.899E+01	1.239E+00
10419760810	104174.81	1.236E-03	3.842E+00	9.543E-01	4.976E+06	1.390E+08	3.824E-01	2.537E-02	1.728E-02	2.049E+01	1.317E+00
10419760817	169443.88	1.236E-03	4.657E+00	1.069E+00	6.825E+06	1.566E+08	4.250E-01	2.907E-02	2.099E-02	2.267E+01	1.461E+00
10419760824	36446.12	1.236E-03	4.681E+00	1.095E+00	6.897E+06	1.581E+08	4.355E-01	2.987E-02	2.186E-02	2.322E+01	1.492E+00
10419760831	6642.09	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419760907	3.20	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419760916	0.00	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419760922	0.00	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419760928	0.00	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.530E+01	1.498E+00
10419761005	0.00	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419761012	0.00	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419761019	0.00	1.236E-03	4.712E+00	1.099E+00	6.910E+06	1.584E+08	4.374E-01	3.001E-02	2.198E-02	2.330E+01	1.498E+00
10419761026	381.01	1.236E-03	4.713E+00	1.099E+00	6.913E+06	1.584E+08	4.376E-01	3.002E-02	2.198E-02	2.331E+01	1.499E+00
10419761102	2408.78	1.241E-03	4.716E+00	1.101E+00	6.923E+06	1.566E+08	4.382E-01	3.007E-02	2.202E-02	2.332E+01	1.501E+00
10419761109	8811.23	1.261E-03	4.737E+00	1.109E+00	6.923E+06	1.586E+08	4.435E-01	3.027E-02	2.213E-02	2.345E+01	1.509E+00
10419761115	7451.48	1.277E-03	4.743E+00	1.114E+00	6.923E+06	1.587E+08	4.466E-01	3.043E-02	2.221E-02	2.353E+01	1.515E+00
10419761122	55584.37	1.520E-03	4.792E+00	1.135E+00	6.923E+06	1.591E+08	4.632E-01	3.164E-02	2.294E-02	2.414E+01	1.571E+00
10419761130	73847.31	1.520E-03	4.873E+00	1.181E+00	6.923E+06	1.604E+08	4.800E-01	3.326E-02	2.327E-02	2.503E+01	1.621E+00
10419761207	129623.31	1.520E-03	4.929E+00	1.303E+00	6.923E+06	1.644E+08	5.140E-01	3.609E-02	2.525E-02	2.721E+01	1.746E+00
10419761214	219175.50	2.478E-03	4.977E+00	1.428E+00	6.923E+06	1.687E+08	5.571E-01	4.088E-02	2.956E-02	2.994E+01	1.932E+00
10419761220	585966.25	5.041E-03	5.234E+00	1.569E+00	6.923E+06	1.746E+08	7.826E-01	5.369E-02	3.597E-02	3.725E+01	2.342E+00
10419761229	704028.00	5.041E-03	7.081E+00	1.723E+00	6.923E+06	1.815E+08	9.427E-01	6.909E-02	4.212E-02	4.910E+01	2.927E+00
10419770104	422076.75	5.041E-03	7.173E+00	1.815E+00	6.923E+06	1.862E+08	1.053E+00	7.831E-02	4.489E-02	5.482E+01	3.029E+00

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10419760714	565432.63	4.327E-01	0.000E+00	2.472E-02	8.653E-02	0.000E+00	1.236E-01	1.236E-03	1.236E-03	0.000E+00
10419760721	414979.44	7.502E-01	0.000E+00	3.380E-02	1.410E-01	0.000E+00	2.053E-01	1.236E-03	2.143E-03	0.000E+00
10419760727	311532.00	9.886E-01	0.000E+00	4.061E-02	1.810E-01	0.000E+00	2.598E-01	1.236E-03	2.825E-03	0.000E+00
10419760803	179052.31	1.126E+00	0.000E+00	4.844E-02	2.092E-01	0.000E+00	2.911E-01	1.236E-03	3.216E-03	0.000E+00
10419760810	104174.81	1.201E+00	0.000E+00	5.755E-02	2.252E-01	0.000E+00	3.093E-01	1.236E-03	3.444E-03	0.000E+00
10419760817	169443.88	1.316E+00	0.000E+00	7.977E-02	2.511E-01	0.000E+00	3.389E-01	1.236E-03	3.814E-03	0.000E+00
10419760824	36446.12	1.339E+00	0.000E+00	8.615E-02	2.567E-01	0.000E+00	3.453E-01	1.236E-03	3.894E-03	0.000E+00
10419760831	6642.09	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419760907	3.20	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419760916	0.00	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419760922	0.00	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419760928	0.00	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419761005	0.00	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419761012	0.00	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419761019	0.00	1.343E+00	0.000E+00	8.760E-02	2.577E-01	0.000E+00	3.465E-01	1.236E-03	3.908E-03	0.000E+00
10419761026	381.01	1.343E+00	2.499E-05	8.781E-02	2.578E-01	0.000E+00	3.466E-01	1.236E-03	3.909E-03	0.000E+00
10419761102	2408.78	1.344E+00	2.883E-04	8.928E-02	2.585E-01	5.266E-06	3.471E-01	1.236E-03	3.920E-03	0.000E+00
10419761109	8811.23	1.350E+00	1.059E-03	9.372E-02	2.611E-01	5.266E-06	3.493E-01	1.236E-03	3.939E-03	0.000E+00
10419761115	7451.48	1.355E+00	1.540E-03	9.681E-02	2.630E-01	5.266E-06	3.510E-01	1.236E-03	3.955E-03	0.000E+00
10419761122	55584.37	1.387E+00	3.978E-03	1.150E-01	2.764E-01	5.266E-06	3.644E-01	1.236E-03	4.077E-03	0.000E+00
10419761130	73847.31	1.429E+00	5.593E-03	1.328E-01	2.925E-01	5.266E-06	3.822E-01	1.236E-03	4.238E-03	0.000E+00
10419761207	129623.31	1.500E+00	5.593E-03	1.526E-01	3.209E-01	5.266E-06	4.162E-01	1.803E-03	4.522E-03	0.000E+00
10419761214	219175.50	1.610E+00	5.593E-03	1.766E-01	3.640E-01	5.266E-06	4.689E-01	2.282E-03	4.522E-03	0.000E+00
10419761220	585966.25	1.892E+00	5.593E-03	2.278E-01	4.665E-01	5.266E-06	5.970E-01	2.282E-03	4.522E-03	0.000E+00
10419761229	704028.00	2.216E+00	5.593E-03	2.740E-01	5.742E-01	5.266E-06	7.509E-01	2.282E-03	4.522E-03	0.000E+00
10419770104	422076.75	2.400E+00	5.593E-03	2.925E-01	6.388E-01	5.266E-06	8.432E-01	2.282E-03	4.522E-03	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME*	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10419770119	793145.06	6.936E-02	1.734E+00	1.907E-01	0.000E+00	5.607E+06	2.670E-01	5.202E-02	3.173E-01	6.069E+00	2.341E+00
10419770127	620081.69	6.936E-02	2.276E+00	3.399E-01	0.000E+00	9.198E+06	3.538E-01	6.558E-02	3.200E-01	1.353E+01	2.965E+00
10419770131	204726.06	6.936E-02	2.321E+00	3.936E-01	0.000E+00	1.021E+07	3.887E-01	7.005E-02	3.223E-01	1.599E+01	3.139E+00
10419770207	285671.19	6.936E-02	2.384E+00	4.748E-01	2.834E+05	1.349E+08	4.724E-01	8.255E-02	3.242E-01	1.980E+01	3.526E+00
10419770216	251481.50	7.046E-02	2.439E+00	5.572E-01	1.531E+06	1.574E+08	4.988E-01	8.804E-02	3.297E-01	2.293E+01	3.774E+00
10419770224	137331.88	7.166E-02	2.619E+00	6.053E-01	1.803E+06	1.666E+08	5.264E-01	8.804E-02	3.321E-01	2.452E+01	3.918E+00
10419770302	217728.13	7.309E-02	2.857E+00	6.862E-01	2.019E+06	1.774E+08	5.636E-01	9.280E-02	3.330E-01	2.676E+01	4.108E+00
10419770310	373439.44	7.391E-02	3.029E+00	8.087E-01	2.019E+06	1.893E+08	6.550E-01	1.010E-01	3.363E-01	3.117E+01	4.410E+00
10419770316	554740.19	7.633E-02	3.263E+00	9.664E-01	2.019E+06	1.940E+08	7.472E-01	1.131E-01	3.411E-01	3.772E+01	4.835E+00
10419770323	622475.38	8.178E-02	3.263E+00	1.170E+00	2.019E+06	2.003E+08	8.887E-01	1.267E-01	3.466E-01	4.493E+01	5.480E+00
10419770401	731503.63	8.178E-02	3.742E+00	1.456E+00	2.019E+06	2.069E+08	1.045E+00	1.427E-01	3.530E-01	5.149E+01	6.048E+00
10419770406	193576.25	8.474E-02	4.123E+00	1.551E+00	2.019E+06	2.085E+08	1.093E+00	1.469E-01	3.555E-01	5.272E+01	6.171E+00
10419770413	164125.06	8.725E-02	4.159E+00	1.670E+00	2.019E+06	2.102E+08	1.143E+00	1.505E-01	3.562E-01	5.387E+01	6.303E+00
10419770420	94538.44	8.849E-02	4.304E+00	1.773E+00	2.113E+06	2.113E+08	1.173E+00	1.588E-01	3.573E-01	5.792E+01	6.417E+00
10419770427	70137.63	8.880E-02	4.457E+00	1.842E+00	2.113E+06	2.130E+08	1.183E+00	1.603E-01	3.582E-01	5.935E+01	6.480E+00
10419770504	91259.94	8.940E-02	4.577E+00	1.922E+00	2.113E+06	2.194E+08	1.207E+00	1.623E-01	3.594E-01	6.078E+01	6.576E+00
10419770511	277705.13	8.940E-02	4.820E+00	2.128E+00	2.113E+06	2.579E+08	1.260E+00	1.684E-01	3.618E-01	6.430E+01	6.891E+00
10419770519	323100.63	8.940E-02	5.435E+00	2.333E+00	2.113E+06	3.234E+08	1.349E+00	1.785E-01	3.675E-01	6.854E+01	7.139E+00
10419770526	559225.31	8.940E-02	6.311E+00	2.700E+00	2.113E+06	4.649E+08	1.495E+00	1.877E-01	3.711E-01	7.624E+01	7.520E+00
10419770601	1203478.00	8.940E-02	7.627E+00	3.516E+00	3.307E+06	7.872E+08	1.790E+00	2.140E-01	3.843E-01	9.519E+01	8.451E+00
10419770608	569425.19	8.940E-02	8.125E+00	3.852E+00	7.826E+06	8.725E+08	1.907E+00	2.264E-01	3.905E-01	1.043E+02	8.887E+00
10419770614	208014.75	8.940E-02	8.489E+00	3.961E+00	1.154E+07	8.752E+08	2.0[illegible]E+00	2.310E-01	3.960E-01	1.081E+02	9.041E+00
10419770621	106973.56	8.940E-02	8.676E+00	4.090E+00	1.281E+07	8.784E+08	2.046E+00	2.333E-01	3.983E-01	1.099E+02	9.111E+00
10419770629	51753.67	8.940E-02	8.735E+00	4.195E+00	1.307E+07	8.810E+08	2.060E+00	2.343E-01	3.998E-01	1.107E+02	9.159E+00
10419770706	75496.25	8.940E-02	9.201E+00	4.285E+00	1.337E+07	8.880E+08	2.071E+00	2.361E-01	4.004E-01	1.117E+02	9.220E+00
10419770713	70736.63	8.940E-02	9.263E+00	4.320E+00	1.365E+07	8.971E+08	2.089E+00	2.377E-01	4.010E-01	1.127E+02	9.283E+00
10419770721	66311.94	8.940E-02	9.552E+00	4.347E+00	1.391E+07	9.043E+08	2.143E+00	2.391E-01	4.015E-01	1.138E+02	9.346E+00
10419770726	11338.65	8.940E-02	9.575E+00	4.351E+00	1.396E+07	9.053E+08	2.153E+00	2.394E-01	4.016E-01	1.140E+02	9.355E+00
10419770802	6191.18	8.949E-02	9.595E+00	4.354E+00	1.401E+07	9.060E+08	2.159E+00	2.398E-01	4.017E-01	1.141E+02	9.362E+00
10419770810	1139.05	8.950E-02	9.599E+00	4.355E+00	1.403E+07	9.061E+08	2.159E+00	2.399E-01	4.017E-01	1.141E+02	9.364E+00
10419770817	3760.01	8.963E-02	9.613E+00	4.358E+00	1.413E+07	9.067E+08	2.160E+00	2.399E-01	4.018E-01	1.141E+02	9.367E+00
10419770822	323459.44	8.963E-02	1.032E+01	4.761E+00	1.509E+07	9.366E+08	2.247E+00	2.470E-01	4.067E-01	1.175E+02	9.679E+00
10419770830	300112.06	8.963E-02	1.078E+01	5.174E+00	1.568E+07	9.571E+08	2.321E+00	2.536E-01	4.080E-01	1.208E+02	9.908E+00
10419770906	83788.69	9.073E-02	1.113E+01	5.308E+00	1.577E+07	9.597E+08	2.336E+00	2.554E-01	4.091E-01	1.215E+02	9.972E+00
10419770913	364186.81	9.311E-02	1.168E+01	5.499E+00	1.829E+07	9.873E+08	2.425E+00	2.634E-01	4.099E-01	1.262E+02	1.029E+01
10419770920	224602.88	9.606E-02	1.193E+01	5.700E+00	1.852E+07	9.913E+08	2.522E+00	2.683E-01	4.119E-01	1.293E+02	1.051E+01
10419770927	77732.00	9.657E-02	1.208E+01	5.748E+00	1.898E+07	9.948E+08	2.553E+00	2.700E-01	4.122E-01	1.305E+02	1.058E+01
10419771004	33103.14	9.657E-02	1.211E+01	5.760E+00	1.934E+07	9.972E+08	2.561E+00	2.707E-01	4.128E-01	1.309E+02	1.061E+01
10419771011	16330.90	9.657E-02	1.213E+01	5.774E+00	1.952E+07	9.981E+08	2.565E+00	2.711E-01	4.129E-01	1.311E+02	1.063E+01
10419771018	197053.66	9.657E-02	1.247E+01	6.041E+00	2.187E+07	1.006E+09	2.623E+00	2.754E-01	4.129E-01	1.337E+02	1.088E+01
10419771025	211204.00	9.888E-02	1.261E+01	6.246E+00	2.375E+07	1.011E+09	2.671E+00	2.800E-01	4.147E-01	1.364E+02	1.124E+01
10419771103	2536088.00	1.377E-01	1.483E+01	7.856E+00	4.136E+07	1.031E+09	3.464E+00	3.909E-01	4.480E-01	1.641E+02	1.124E+01
10419771108	1507543.00	1.377E-01	1.549E+01	8.581E+00	5.332E+07	1.056E+09	3.899E+00	4.238E-01	4.612E-01	1.819E+02	1.196E+01
10419771115	1986337.00	1.464E-01	2.027E+01	9.363E+00	7.106E+07	1.099E+09	4.433E+00	4.238E-01	4.872E-01	2.067E+02	1.309E+01
10419771122	815044.38	1.589E-01	2.454E+01	9.613E+00	7.995E+07	1.123E+09	4.632E+00	4.417E-01	5.060E-01	2.177E+02	1.366E+01
10419771129	584786.19	1.652E-01	2.480E+01	9.740E+00	8.749E+07	1.144E+09	4.758E+00	4.544E-01	5.119E-01	2.235E+02	1.401E+01
10419771206	434544.56	1.652E-01	2.537E+01	9.902E+00	9.137E+07	1.176E+09	4.864E+00	4.639E-01	5.138E-01	2.276E+02	1.438E+01
10419771212	306017.63	1.703E-01	2.554E+01	1.011E+01	9.329E+07	1.218E+09	5.029E+00	4.724E-01	5.155E-01	2.346E+02	1.483E+01
10419771220	546190.00	1.811E-01	2.590E+01	1.040E+01	9.545E+07	1.267E+09	5.156E+00	4.843E-01	5.167E-01	2.423E+02	1.520E+01
10419771230	1078354.00	2.262E-01	2.795E+01	1.134E+01	9.918E+07	1.386E+09	5.604E+00	4.843E-01	5.208E-01	2.690E+02	1.626E+01
10419780105	927493.75	2.546E-01	2.977E+01	1.181E+01	1.001E+08	1.415E+09	5.837E+00	5.046E-01	5.269E-01	2.822E+02	1.667E+01

Appendix E (Cont'd)

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CUMULATIVE NUTRIENT  MASS TABLE

 ST. DATE    FLOW VOLUME        NA          K         CA         MG         CU         FE         MN         ZN         CD
10419770119   793145.06 5.376E-01 3.468E-02 6.936E-02 8.670E-02 0.000E+00 1.214E-01 5.202E-03 6.936E-03 0.000E+00
10419770127   620081.69 1.012E+00 7.535E-02 1.371E-01 1.409E-01 0.000E+00 2.027E-01 1.062E-02 1.371E-02 0.000E+00
10419770131   204726.06 1.196E+00 9.326E-02 1.640E-01 1.544E-01 0.000E+00 2.251E-01 1.206E-02 1.603E-02 0.000E+00
10419770207   285671.19 1.477E+00 1.245E-01 2.140E-01 1.731E-01 0.000E+00 2.563E-01 1.723E-02 2.247E-02 0.000E+00
10419770216   251481.50 1.708E+00 1.575E-01 2.525E-01 1.896E-01 0.000E+00 2.838E-01 1.943E-02 2.632E-02 0.000E+00
10419770224   137351.88 1.822E+00 1.815E-01 2.675E-01 1.906E-01 0.000E+00 2.988E-01 1.973E-02 2.732E-02 0.000E+00
10419770302   217728.13 1.988E+00 2.291E-01 2.913E-01 2.129E-01 0.000E+00 3.274E-01 1.973E-02 2.895E-02 0.000E+00
10419770310   373439.44 2.250E+00 3.189E-01 3.239E-01 2.374E-01 0.000E+00 3.846E-01 1.973E-02 3.050E-02 0.000E+00
10419770316   554740.19 2.634E+00 4.644E-01 3.724E-01 2.738E-01 0.000E+00 4.937E-01 1.973E-02 3.179E-02 0.000E+00
10419770323   622475.38 3.028E+00 6.414E-01 4.269E-01 3.146E-01 0.000E+00 6.434E-01 1.973E-02 3.179E-02 0.000E+00
10419770401   731503.63 3.476E+00 8.813E-01 4.908E-01 3.786E-01 0.000E+00 8.673E-01 1.973E-02 3.179E-02 0.000E+00
10419770406   193576.25 3.836E+00 9.363E-01 5.035E-01 3.985E-01 0.000E+00 9.181E-01 1.973E-02 3.179E-02 0.000E+00
10419770413   164125.06 4.256E+00 9.793E-01 5.143E-01 4.098E-01 0.000E+00 9.576E-01 1.973E-02 3.179E-02 0.000E+00
10419770420    94538.44 4.586E+00 1.002E+00 5.205E-01 4.181E-01 0.000E+00 9.782E-01 1.973E-02 3.179E-02 0.000E+00
10419770427    70137.63 4.904E+00 1.017E+00 5.251E-01 4.242E-01 0.000E+00 9.920E-01 1.973E-02 3.179E-02 0.000E+00
10419770504    91259.94 5.407E+00 1.037E+00 5.311E-01 4.322E-01 0.000E+00 1.010E+00 1.973E-02 3.199E-02 0.000E+00
10419770511   277705.13 6.613E+00 1.098E+00 5.432E-01 4.504E-01 0.000E+00 1.059E+00 1.973E-02 3.260E-02 0.000E+00
10419770519   323100.63 7.647E+00 1.169E+00 5.503E-01 4.716E-01 0.000E+00 1.108E+00 1.973E-02 3.331E-02 0.000E+00
10419770526   559225.81 8.698E+00 1.291E+00 5.625E-01 5.083E-01 0.000E+00 1.181E+00 1.973E-02 3.453E-02 0.000E+00
10419770601  1203478.00 9.619E+00 1.580E+00 6.152E-01 5.872E-01 0.000E+00 1.366E+00 1.973E-02 3.979E-02 0.000E+00
10419770608   569425.19 1.005E+01 1.717E+00 6.276E-01 6.246E-01 0.000E+00 1.465E+00 1.973E-02 4.220E-02 0.000E+00
10419770614   208014.75 1.021E+01 1.767E+00 6.276E-01 6.392E-01 0.000E+00 1.511E+00 1.973E-02 4.319E-02 0.000E+00
10419770621   106973.56 1.030E+01 1.793E+00 6.276E-01 6.476E-01 0.000E+00 1.539E+00 1.973E-02 4.366E-02 0.000E+00
10419770629    51753.67 1.034E+01 1.807E+00 6.276E-01 6.532E-01 0.000E+00 1.555E+00 1.973E-02 4.388E-02 0.000E+00
10419770706    75496.25 1.039E+01 1.830E+00 6.293E-01 6.648E-01 0.000E+00 1.584E+00 1.973E-02 4.438E-02 0.000E+00
10419770713    70736.63 1.045E+01 1.847E+00 6.293E-01 6.741E-01 0.000E+00 1.609E+00 1.973E-02 4.500E-02 0.000E+00
10419770721    66311.94 1.049E+01 1.860E+00 6.293E-01 6.813E-01 0.000E+00 1.629E+00 1.973E-02 4.587E-02 0.000E+00
10419770726    11388.65 1.050E+01 1.862E+00 6.293E-01 6.826E-01 0.000E+00 1.633E+00 1.976E-02 4.607E-02 0.000E+00
10419770802     6191.18 1.051E+01 1.862E+00 6.294E-01 6.834E-01 0.000E+00 1.634E+00 1.979E-02 4.620E-02 0.000E+00
10419770810     1139.95 1.051E+01 1.862E+00 6.294E-01 6.835E-01 0.000E+00 1.635E+00 1.979E-02 4.622E-02 0.000E+00
10419770817     3760.01 1.051E+01 1.863E+00 6.295E-01 6.840E-01 0.000E+00 1.635E+00 1.979E-02 4.628E-02 0.000E+00
10419770822   323459.44 1.074E+01 1.870E+00 6.436E-01 7.265E-01 0.000E+00 1.713E+00 1.979E-02 5.052E-02 0.000E+00
10419770830   300112.06 1.095E+01 1.870E+00 6.568E-01 7.658E-01 0.000E+00 1.785E+00 1.979E-02 5.380E-02 0.000E+00
10419770906    83788.69 1.101E+01 1.870E+00 6.641E-01 7.786E-01 0.000E+00 1.807E+00 1.979E-02 5.472E-02 0.000E+00
10419770913   364186.81 1.129E+01 1.870E+00 6.641E-01 8.264E-01 1.592E-03 1.871E+00 1.979E-02 5.631E-02 0.000E+00
10419770920   224602.88 1.146E+01 1.884E+00 6.739E-01 8.559E-01 2.083E-03 1.910E+00 1.979E-02 5.680E-02 0.000E+00
10419770927    77732.00 1.153E+01 1.895E+00 6.807E-01 8.661E-01 2.083E-03 1.926E+00 1.979E-02 5.697E-02 0.000E+00
10419771004    33105.14 1.156E+01 1.902E+00 6.865E-01 8.719E-01 2.083E-03 1.933E+00 1.979E-02 5.712E-02 0.000E+00
10419771011    16330.90 1.157E+01 1.904E+00 6.886E-01 8.740E-01 2.083E-03 1.936E+00 1.979E-02 5.715E-02 0.000E+00
10419771018   197053.06 1.173E+01 1.922E+00 7.102E-01 8.912E-01 2.083E-03 1.962E+00 1.979E-02 5.758E-02 0.000E+00
10419771025   211204.00 1.180E+01 1.926E+00 7.287E-01 9.051E-01 2.083E-03 1.985E+00 1.979E-02 5.805E-02 0.000E+00
10419771103  2536088.00 1.371E+01 1.926E+00 9.504E-01 1.016E+00 7.628E-03 2.262E+00 1.979E-02 6.359E-02 0.000E+00
10419771108  1507543.00 1.513E+01 1.926E+00 2.532E+00 1.280E+00 1.092E-02 2.427E+00 1.979E-02 7.018E-02 0.000E+00
10419771115  1986337.001.726E+01 1.926E+00 5.659E+00 1.757E+00 1.527E-02 2.644E+00 1.979E-02 7.887E-02 0.000E+00
10419771122   815044.38 1.827E+01 1.926E+00 7.548E+00 2.042E+00 1.705E-02 2.781E+00 1.979E-02 8.421E-02 0.000E+00
10419771129   584786.19 1.912E+01 1.926E+00 9.364E+00 2.337E+00 1.961E-02 2.853E+00 1.979E-02 9.061E-02 0.000E+00
10419771206   434544.56 1.939E+01 1.926E+00 9.430E+00 2.365E+00 1.961E-02 2.901E+00 1.979E-02 9.156E-02 0.000E+00
10419771212   386017.63 1.964E+01 1.926E+00 9.481E+00 2.390E+00 1.961E-02 2.943E+00 1.979E-02 9.240E-02 0.000E+00
10419771220   546190.00 1.998E+01 1.926E+00 9.540E+00 2.426E+00 1.961E-02 3.003E+00 1.979E-02 9.359E-02 0.000E+00
10419771230  1078354.002.122E+01 1.926E+00 9.705E+00 2.590E+00 1.961E-02 3.208E+00 1.979E-02 9.770E-02 0.000E+00
10419780105   927493.75 2.186E+01 1.926E+00 9.706E+00 2.712E+00 1.961E-02 3.358E+00 2.182E-02 1.038E-01 0.000E+00
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Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10419780110	263093.94	3.552E-03	1.776E-01	6.216E-02	8.059E+05	6.447E+06	5.284E-02	0.000E+00	8.880E-04	2.709E+00	6.216E-02
10419780117	800273.06	1.055E-02	1.776E-01	1.846E-01	7.157E+06	3.105E+07	2.680E-01	1.750E-02	6.137E-03	1.303E+01	2.196E-01
10419780124	1798834.00	1.440E-02	1.751E+00	4.599E-01	1.429E+07	1.675E+08	6.417E-01	5.682E-02	2.187E-02	3.309E+01	4.163E-01
10419780131	2130513.00	1.440E-02	1.751E+00	8.326E-01	1.429E+07	4.211E+08	1.084E+00	1.034E-01	3.584E-02	5.024E+01	1.534E+00
10419780207	1428469.00	1.761E-02	4.249E+00	1.082E+00	1.429E+07	7.186E+08	1.337E+00	1.346E-01	4.521E-02	7.073E+01	1.870E+00
10419780216	832178.31	2.48[illegible]E-02	4.795E+00	1.228E+00	1.429E+07	9.663E+08	1.485E+00	1.528E-01	5.249E-02	7.747E+01	2.114E+00
10419780224	627072.31	2.763E-02	4.932E+00	1.434E+00	1.429E+07	1.153E+09	1.597E+00	1.528E-01	5.934E-02	8.254E+01	2.210E+00
10419780228	267269.88	2.821E-02	4.991E+00	1.560E+00	1.429E+07	1.232E+09	1.646E+00	1.587E-01	6.285E-02	8.470E+01	2.222E+00
10419780308	1137322.00	3.070E-02	1.295E+01	2.239E+00	1.429E+07	1.459E+09	1.840E+00	1.835E-01	7.280E-02	9.415E+01	3.042E+00
10419780314	1007555.69	4.612E-02	1.449E+01	3.054E+00	1.429E+07	1.462E+09	2.032E+00	2.056E-01	8.601E-02	1.025E+02	3.571E+00
10419780321	733302.75	5.253E-02	1.561E+01	3.407E+00	1.429E+07	1.467E+09	2.230E+00	2.216E-01	8.922E-02	1.115E+02	3.587E+00
10419780329	710055.81	6.029E-02	1.577E+01	3.500E+00	1.500E+07	1.474E+09	2.378E+00	2.526E-01	9.543E-02	1.196E+02	3.634E+00
10419780405	797041.31	6.552E-02	1.612E+01	3.709E+00	1.579E+07	1.486E+09	2.608E+00	2.701E-01	9.717E-02	1.285E+02	3.669E+00
10419780412	338649.81	6.626E-02	1.634E+01	3.843E+00	1.613E+07	1.493E+09	2.679E+00	2.701E-01	9.791E-02	1.319E+02	3.720E+00
10419780419	180400.00	6.626E-02	1.653E+01	3.941E+00	1.630E+07	1.497E+09	2.704E+00	2.740E-01	9.870E-02	1.335E+02	3.787E+00
10419780425	324408.31	6.626E-02	1.682E+01	4.133E+00	1.695E+07	1.505E+09	2.761E+00	2.811E-01	1.008E-01	1.364E+02	3.915E+00
10419780427	263665.56	6.799E-02	1.722E+01	4.300E+00	1.773E+07	1.512E+09	2.785E+00	2.926E-01	1.031E-01	1.393E+02	3.943E+00
10419780502	1314420.00	6.799E-02	2.239E+01	5.191E+00	2.295E+07	1.548E+09	2.946E+00	3.214E-01	1.204E-01	1.520E+02	4.007E+00
10419780510	1799240.00	7.192E-02	2.554E+01	6.135E+00	2.652E+07	1.595E+09	3.355E+00	3.607E-01	1.322E-01	1.693E+02	4.166E+00
10419780516	1548321.00	9.223E-02	2.622E+01	6.575E+00	2.652E+07	1.632E+09	3.613E+00	3.946E-01	1.356E-01	1.832E+02	5.181E+00
10419780522	1043696.50	1.036E-01	2.690E+01	6.826E+00	2.755E+07	1.663E+09	3.739E+00	4.174E-01	1.538E-01	1.960E+02	5.181E+00
10419780529	1069925.00	1.083E-01	3.041E+01	7.060E+00	3.074E+07	1.702E+09	3.962E+00	4.408E-01	1.632E-01	2.062E+02	5.228E+00
10419780606	708305.94	1.130E-01	3.103E+01	7.261E+00	3.284E+07	1.737E+09	4.080E+00	4.563E-01	1.663E-01	2.161E+02	5.228E+00
10419780614	1224899.00	1.290E-01	3.157E+01	7.716E+00	3.649E+07	1.819E+09	4.396E+00	4.830E-01	1.823E-01	2.348E+02	5.228E+00
10419780620	442198.88	1.290E-01	3.195E+01	7.939E+00	3.781E+07	1.861E+09	4.474E+00	4.927E-01	1.920E-01	2.413E+02	5.238E+00
10419780628	256486.50	1.296E-01	3.274E+01	8.096E+00	3.857E+07	1.892E+09	4.533E+00	4.983E-01	2.060E-01	2.453E+02	5.243E+00
10419780705	108859.75	1.301E-01	3.276E+01	8.227E+00	4.116E+07	1.912E+09	4.557E+00	5.007E-01	2.079E-01	2.472E+02	5.253E+00
10419780712	36455.67	1.301E-01	3.286E+01	8.290E+00	4.272E+07	1.921E+09	4.565E+00	5.015E-01	2.082E-01	2.479E+02	5.259E+00
10419780718	16182.46	1.305E-01	3.287E+01	8.312E+00	4.424E+07	1.927E+09	4.569E+00	5.018E-01	2.085E-01	2.481E+02	5.266E+00
10419780725	23444.33	1.306E-01	3.290E+01	8.336E+00	4.750E+07	1.937E+09	4.576E+00	3.024E-01	2.086E-01	2.484E+02	5.279E+00
10419780801	583806.56	1.306E-01	3.482E+01	8.770E+00	8.804E+07	2.108E+09	4.705E+00	5.151E-01	2.124E-01	2.555E+02	5.432E+00
10419780808	1982387.00	1.349E-01	3.742E+01	9.724E+00	9.000E+07	2.403E+09	5.871E+00	5.585E-01	2.254E-01	2.815E+02	5.519E+00
10419780814	911389.44	1.349E-01	3.781E+01	1.044E+01	1.198E+08	2.596E+09	6.128E+00	5.784E-01	2.493E-01	2.943E+02	5.539E+00
10419780823	1673609.00	1.349E-01	3.855E+01	1.223E+01	2.211E+08	3.045E+09	6.589E+00	6.150E-01	2.640E-01	3.177E+02	5.758E+00
10419780829	232537.50	1.349E-01	3.931E+01	1.249E+01	2.283E+08	3.072E+09	6.667E+00	6.201E-01	3.260E-01	3.210E+02	5.779E+00
10419780905	91888.19	1.349E-01	3.939E+01	1.259E+01	2.293E+08	3.073E+09	6.693E+00	6.221E-01	3.270E-01	3.210E+02	5.783E+00
10419780912	27483.02	1.349E-01	3.950E+01	1.261E+01	2.302E+08	3.074E+09	6.703E+00	6.227E-01	3.273E-01	3.210E+02	5.790E+00
10419780919	5187.97	1.350E-01	3.951E+01	1.262E+01	2.305E+08	3.075E+09	6.704E+00	6.228E-01	3.273E-01	3.210E+02	5.791E+00
10419780926	826.77	1.350E-01	3.951E+01	1.262E+01	2.305E+08	3.075E+09	6.705E+00	6.228E-01	3.273E-01	3.210E+02	5.791E+00
10419781003	1169.95	1.350E-01	3.951E+01	1.262E+01	2.307E+08	3.075E+09	6.705E+00	6.229E-01	3.273E-01	3.210E+02	5.791E+00
10419781010	6292.32	1.350E-01	3.952E+01	1.262E+01	2.310E+08	3.077E+09	6.707E+00	6.230E-01	3.274E-01	3.210E+02	5.792E+00
10419781017	2671.21	1.350E-01	3.953E+01	1.262E+01	2.310E+08	3.077E+09	6.708E+00	6.230E-01	3.274E-01	3.210E+02	5.793E+00
10419781025	230.64	1.350E-01	3.953E+01	1.262E+01	2.310E+08	3.077E+09	6.708E+00	6.231E-01	3.274E-01	3.210E+02	5.793E+00
10419781031	0.00	1.350E-01	3.953E+01	1.262E+01	2 310E+08	3.077E+09	6.708E+00	6.231E-01	3.274E-01	3.210E+02	5.793E+00
10419781109	0.00	1.350E-01	3.953E+01	1.262E+01	2.310E+08	3.077E+09	6.708E+00	6.231E-01	3.274E-01	3.210E+02	5.793E+00
10419781114	0.00	1.350E-01	3.953E+01	1.262E+01	2.310E+08	3.077E+09	6.708E+00	6.231E-01	3.274E-01	3.210E+02	5.793E+00
10419781121	0.00	1.350E-01	3.953E+01	1.262E+01	2.310E+08	3.077E+09	6.708E+00	6.231E-01	3.274E-01	3.210E+02	5.793E+00
10419781128	0.00	1.350E-01	3.953E+01	1.262E+01	2.310E+08	3.077E+09	6.708E+00	6.231E-01	3.274E-01	3.210E+02	5.793E+00
10419781205	20053.61	1.350E-01	3.956E+01	1.263E+01	2.311E+08	3.078E+09	6.709E+00	6.240E-01	3.276E-01	3.210E+02	5.804E+00
10419781213	66058.94	1.359E-01	3.956E+01	1.264E+01	2.316E+08	3.079E+09	6.728E+00	6.263E-01	3.282E-01	3.210E+02	5.811E+00
10419781219	42797.67	1.359E-01	3.960E+01	1.266E+01	2.320E+08	3.082E+09	6.746E+00	6.272E-01	3.285E-01	3.210E+02	5.858E+00
10419781228	194707.31	1.359E-01	3.973E+01	1.272E+01	2.337E+08	3.101E+09	6.790E+00	6.314E-01	3.324E-01	3.210E+02	5.977E+00
10419790104	553485.44	1.371E-01	4.022E+01	1.287E+01	2.365E+08	3.140E+09	6.922E+00	6.435E-01	3.340E-01	3.210E+02	6.437E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10419780110	203093.94	1.376E-01	0.000E+00	1.776E-02	2.220E-02	0.000E+00	2.664E-02	0.000E+00	8.880E-04	0.000E+00
10419780117	800273.06	6.625E-01	0.000E+00	8.775E-02	9.219E-02	0.000E+00	1.141E-01	0.000E+00	2.638E-03	0.000E+00
10419780124	1798834.00	1.842E+00	0.000E+00	2.451E-01	2.102E-01	0.000E+00	3.198E-01	0.000E+00	2.638E-03	0.000E+00
10419780131	2130513.00	3.240E+00	0.000E+00	4.314E-01	3.033E-01	0.000E+00	5.437E-01	0.000E+00	2.638E-03	0.000E+00
10419780207	1428469.00	4.208E+00	0.000E+00	5.875E-01	3.658E-01	3.123E-03	7.310E-01	0.000E+00	2.638E-03	0.000E+00
10419780216	832178.31	4.736E+00	0.000E+00	6.603E-01	4.022E-01	4.942E-03	8.220E-01	0.000E+00	2.638E-03	0.000E+00
10419780224	627072.31	5.106E+00	0.000E+00	7.151E-01	4.433E-01	7.684E-03	8.906E-01	0.000E+00	2.638E-03	0.000E+00
10419780228	267269.88	5.258E+00	5.843E-03	7.385E-01	4.667E-01	9.437E-03	9.198E-01	5.843E-04	3.222E-03	0.000E+00
10419780308	1137322.09	5.904E+00	5.557E-02	8.380E-01	5.910E-01	1.938E-02	1.044E+00	5.557E-03	8.195E-03	0.000E+00
10419780314	1007555.69	6.521E+00	7.760E-02	9.261E-01	7.011E-01	2.379E-02	1.154E+00	7.760E-03	1.480E-02	0.000E+00
10419780321	733302.75	6.986E+00	7.760E-02	9.902E-01	7.813E-01	2.539E-02	1.234E+00	9.363E-03	2.122E-02	0.000E+00
10419780329	710055.81	7.467E+00	7.760E-02	1.052E+00	8.589E-01	2.539E-02	1.312E+00	1.092E-02	2.898E-02	0.000E+00
10419780405	797041.31	8.077E+00	7.760E-02	1.122E+00	9.461E-01	2.539E-02	1.434E+00	1.440E-02	4.292E-02	0.000E+00
10419780412	338649.81	8.329E+00	7.760E-02	1.152E+00	9.831E-01	2.539E-02	1.478E+00	1.514E-02	4.736E-02	0.000E+00
10419780419	180400.00	8.459E+00	7.760E-02	1.167E+00	1.003E+00	2.539E-02	1.498E+00	1.514E-02	4.894E-02	0.000E+00
10419780425	324408.31	8.686E+00	7.760E-02	1.196E+00	1.038E+00	2.539E-02	1.527E+00	1.514E-02	5.107E-02	0.000E+00
10419780427	263665.56	8.865E+00	7.760E-02	1.219E+00	1.067E+00	2.539E-02	1.550E+00	1.514E-02	5.222E-02	0.000E+00
10419780502	1314420.00	9.784E+00	7.760E-02	1.363E+00	1.240E+00	2.827E-02	1.665E+00	1.514E-02	5.797E-02	0.000E+00
10419780510	1799240.00	1.096E+01	7.760E-02	1.520E+00	1.436E+00	3.220E-02	1.822E+00	1.514E-02	6.190E-02	0.000E+00
10419780516	1548321.00	1.191E+01	7.760E-02	1.621E+00	1.572E+00	3.558E-02	1.957E+00	1.514E-02	6.529E-02	0.000E+00
10419780522	1043696.50	1.253E+01	7.760E-02	1.667E+00	1.640E+00	3.787E-02	2.049E+00	1.514E-02	6.757E-02	0.000E+00
10419780529	1069925.00	1.314E+01	7.760E-02	1.690E+00	1.710E+00	4.021E-02	2.142E+00	1.514E-02	6.991E-02	0.000E+00
10419780606	708305.94	1.352E+01	7.760E-02	1.721E+00	1.757E+00	4.175E-02	2.204E+00	1.514E-02	7.300E-02	0.000E+00
10419780614	1224899.00	1.422E+01	7.760E-02	1.775E+00	1.837E+00	4.175E-02	2.311E+00	1.514E-02	7.560E-02	0.000E+00
10419780620	442198.88	1.449E+01	7.760E-02	1.794E+00	1.866E+00	4.175E-02	2.350E+00	1.514E-02	7.665E-02	0.000E+00
10419780628	256486.50	1.465E+01	7.760E-02	1.806E+00	1.883E+00	4.175E-02	2.372E+00	1.514E-02	7.721E-02	0.000E+00
10419780705	108859.75	1.473E+01	7.760E-02	1.815E+00	1.892E+00	4.175E-02	2.387E+00	1.538E-02	7.769E-02	0.000E+00
10419780712	36455.87	1.475E+01	7.760E-02	1.818E+00	1.896E+00	4.175E-02	2.391E+00	1.546E-02	7.784E-02	0.000E+00
10419780718	16182.46	1.476E+01	7.760E-02	1.820E+00	1.897E+00	4.175E-02	2.392E+00	1.549E-02	7.792E-02	0.000E+00
10419780725	23444.33	1.477E+01	7.760E-02	1.822E+00	1.899E+00	4.175E-02	2.394E+00	1.555E-02	7.802E-02	0.000E+00
10419780801	583806.56	1.492E+01	7.760E-02	1.873E+00	1.950E+00	4.431E-02	2.445E+00	1.682E-02	8.312E-02	0.000E+00
10419780808	1982387.00	1.596E+01	6.844E-01	2.003E+00	2.167E+00	4.864E-02	2.618E+00	1.682E-02	9.613E-02	0.000E+00
10419780814	911309.44	1.660E+01	1.262E+00	2.043E+00	2.206E+00	4.864E-02	2.698E+00	1.682E-02	1.001E-01	0.000E+00
10419780823	1673609.00	1.840E+01	2.799E+00	2.079E+00	2.542E+00	4.864E-02	2.844E+00	1.682E-02	1.038E-01	0.000E+00
10419780829	232537.50	1.872E+01	3.109E+00	2.084E+00	2.588E+00	4.864E-02	2.865E+00	1.682E-02	1.043E-01	0.000E+00
10419780905	91888.19	1.887E+01	3.260E+00	2.088E+00	2.610E+00	4.864E-02	2.873E+00	1.682E-02	1.045E-01	0.000E+00
10419780912	27483.02	1.891E+01	3.293E+00	2.090E+00	2.616E+00	4.864E-02	2.875E+00	1.682E-02	1.046E-01	0.000E+00
10419780919	8187.97	1.891E+01	3.298E+00	2.090E+00	2.617E+00	4.864E-02	2.876E+00	1.682E-02	1.046E-01	0.000E+00
10419780926	826.77	1.891E+01	3.298E+00	2.090E+00	2.617E+00	4.864E-02	2.876E+00	1.682E-02	1.046E-01	0.000E+00
10419781003	1169.95	1.891E+01	3.298E+00	2.090E+00	2.617E+00	4.864E-02	2.876E+00	1.682E-02	1.047E-01	0.000E+00
10419781010	6292.32	1.892E+01	3.299E+00	2.090E+00	2.617E+00	4.864E-02	2.877E+00	1.682E-02	1.047E-01	0.000E+00
10419781017	2671.21	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781025	230.64	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781031	0.00	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781109	0.00	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781114	0.00	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781121	0.00	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781128	0.00	1.892E+01	3.299E+00	2.090E+00	2.618E+00	4.864E-02	2.877E+00	1.682E-02	1.048E-01	0.000E+00
10419781205	20053.61	1.894E+01	3.308E+00	2.092E+00	2.620E+00	4.864E-02	2.880E+00	1.682E-02	1.050E-01	0.000E+00
10419781213	66058.94	1.899E+01	3.331E+00	2.098E+00	2.620E+00	4.864E-02	2.889E+00	1.682E-02	1.056E-01	0.000E+00
10419781219	42797.67	1.902E+01	3.342E+00	2.102E+00	2.631E+00	4.864E-02	2.894E+00	1.682E-02	1.057E-01	0.000E+00
10419781228	194707.31	1.914E+01	3.380E+00	2.119E+00	2.648E+00	4.864E-02	2.920E+00	1.682E-02	1.062E-01	0.000E+00
10419790104	553485.44	1.947E+01	3.465E+00	2.167E+00	2.697E+00	5.106E-02	3.005E+00	1.682E-02	1.074E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	CO. -F	COL-T	TKN	NH4-N	P	TOC	CL
10419790116	1794847.00	1.177E-02	8.633E+00	3.924E-01	3.561E+06	4.807E+07	3.963E-01	3.924E-02	1.177E-02	0.000E+00	1.216E+00
10419790123	1382566.00	1.177E-02	1.075E+01	7.854E-01	4.932E+06	4.944E+07	8.014E-01	6.947E-02	1.782E-02	0.000E+00	2.214E+00
10419790130	1120378.00	1.177E-02	1.197E+01	9.568E-01	4.932E+06	5.389E+07	1.438E+00	9.396E-02	2.517E-02	0.000E+00	2.949E+00
10419790206	616950.44	1.177E-02	1.278E+01	9.838E-01	4.932E+06	5.878E+07	1.570E+00	1.078E-01	6.158E-02	0.000E+00	3.016E+00
10419790213	356090.88	1.489E-02	1.341E+01	1.038E+00	5.639E+06	6.161E+07	1.664E+00	1.152E-01	6.392E-02	0.000E+00	3.265E+00
10419790222	550964.13	1.850E-02	1.413E+01	1.195E+00	8.372E+06	6.598E+07	1.782E+00	1.273E-01	6.874E-02	0.000E+00	3.422E+00
10419790227	713895.75	2.786E-02	1.741E+01	1.523E+00	1.475E+07	7.236E+07	1.961E+00	1.429E-01	7.498E-02	0.000E+00	3.562E+00
10419790307	1504735.00	2.786E-02	1.806E+01	2.246E+00	2.519E+07	8.261E+07	2.264E+00	1.758E-01	7.498E-02	0.000E+00	4.418E+00
10419790313	1270164.00	2.786E-02	2.004E+01	2.941E+00	3.275E+07	8.785E+07	2.622E+00	2.036E-01	8.807E-02	0.000E+00	5.251E+00
10419790320	700674.25	2.940E-02	2.115E+01	3.308E+00	3.404E+07	8.993E+07	2.739E+00	2.189E-01	9.193E-02	0.000E+00	5.573E+00
10419790327	431151.50	2.940E-02	2.284E+01	3.535E+00	3.484E+07	9.121E+07	2.818E+00	2.283E-01	9.382E-02	0.000E+00	5.855E+00
10419790405	576411.13	3.318E-02	2.637E+01	3.787E+00	3.484E+07	9.350E+07	2.931E+00	2.409E-01	9.634E-02	0.000E+00	6.170E+00
10419790411	448114.75	3.318E-02	2.833E+01	3.934E+00	3.520E+07	9.661E+07	2.986E+00	2.507E-01	9.928E-02	0.000E+00	6.425E+00
10419790417	634493.69	3.318E-02	3.055E+01	4.253E+00	4.409E+07	1.300E+08	3.185E+00	3.062E-01	1.020E-01	0.000E+00	6.675E+00
10419790424	523366.25	3.318E-02	3.124E+01	4.607E+00	5.863E+07	1.819E+08	3.396E+00	3.748E-01	1.055E-01	0.000E+00	6.949E+00
10419790501	483969.19	3.741E-02	3.230E+01	4.882E+00	6.535E+07	2.160E+08	3.627E+00	4.595E-01	1.097E-01	0.000E+00	7.182E+00
10419790509	360482.69	3.741E-02	3.340E+01	5.064E+00	6.535E+07	2.313E+08	3.702E+00	4.674E-01	1.113E-01	0.000E+00	7.367E+00
10419790516	298377.94	3.806E-02	3.366E+01	5.194E+00	6.713E+07	2.432E+08	3.768E+00	4.739E-01	1.139E-01	0.000E+00	7.537E+00
10419790522	641554.69	3.806E-02	3.394E+01	5.461E+00	7.477E+07	2.680E+08	3.949E+00	4.879E-01	1.223E-01	0.000E+00	7.818E+00
10419790529	661021.75	3.806E-02	3.409E+01	5.807E+00	9.444E+07	3.178E+08	4.102E+00	5.024E-01	1.252E-01	0.000E+00	7.861E+00
10419790606	372663.88	3.888E-02	3.441E+01	6.068E+00	1.137E+08	3.622E+08	4.204E+00	5.105E-01	1.268E-01	0.000E+00	7.934E+00
10419790612	204249.81	3.932E-02	3.477E+01	6.202E+00	1.228E+08	3.825E+08	4.259E+00	5.150E-01	1.268E-01	0.000E+00	8.068E+00
10419790619	118744.44	3.932E-02	3.498E+01	6.280E+00	1.275E+08	3.925E+08	4.291E+00	5.176E-01	1.279E-01	0.000E+00	8.084E+00
10419790626	57797.07	3.932E-02	3.508E+01	6.329E+00	1.294E+08	3.964E+08	4.306E+00	5.201E-01	1.283E-01	0.000E+00	8.134E+00
10419790703	50466.70	3.932E-02	3.533E+01	6.382E+00	1.308E+08	3.990E+08	4.323E+00	5.212E-01	1.287E-01	0.000E+00	8.159E+00
10419790710	31663.07	3.939E-02	3.539E+01	6.422E+00	1.316E+08	4.001E+08	4.339E+00	5.240E-01	1.292E-01	0.000E+00	8.181E+00
10419790717	14063.02	3.939E-02	3.539E+01	6.436E+00	1.318E+08	4.010E+08	4.344E+00	5.243E-01	1.294E-01	0.000E+00	8.184E+00
10419790723	19289.25	3.939E-02	3.539E+01	6.451E+00	1.322E+08	4.020E+08	4.350E+00	5.247E-01	1.296E-01	0.000E+00	8.190E+00

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MC	CU	FE	MN	ZN	CD
10419790116	1794847.00	1.609E+00	5.101E-01	1.687E+00	3.924E-01	2.354E-02	3.924E-01	0.000E+00	3.924E-03	0.000E+00
10419790123	1382566.00	3.090E+00	1.024E+00	3.682E+00	8.156E-01	4.773E-02	7.851E-01	0.000E+00	6.947E-03	0.000E+00
10419790130	1120378.00	4.511E+00	1.538E+00	5.862E+00	1.256E+00	7.222E-02	1.098E+00	2.449E-03	9.396E-03	0.000E+00
10419790206	616950.44	5.428E+00	1.889E+00	7.307E+00	1.533E+00	9.110E-02	1.341E+00	5.147E-03	1.209E-02	0.000E+00
10419790213	356090.88	5.926E+00	2.037E+00	8.048E+00	1.678E+00	9.889E-02	1.450E+00	5.926E-03	1.287E-02	0.000E+00
10419790222	550964.13	6.649E+00	2.194E+00	8.735E+00	1.810E+00	1.061E-01	1.570E+00	5.926E-03	1.287E-02	0.000E+00
10419790227	713895.75	7.523E+00	2.272E+00	9.078E+00	1.888E+00	1.092E-01	1.664E+00	5.926E-03	1.287E-02	0.000E+00
10419790307	1504735.00	9.332E+00	2.337E+00	9.177E+00	1.954E+00	1.092E-01	1.796E+00	5.926E-03	1.287E-02	0.000E+00
10419790313	1270164.00	1.061E+01	2.365E+00	9.233E+00	2.010E+00	1.092E-01	1.879E+00	5.926E-03	1.287E-02	0.000E+00
10419790320	700674.25	1.121E+01	2.365E+00	9.248E+00	2.040E+00	1.092E-01	1.925E+00	5.926E-03	1.287E-02	0.000E+00
10419790327	431151.50	1.150E+01	2.365E+00	9.257E+00	2.059E+00	1.092E-01	1.953E+00	5.926E-03	1.287E-02	0.000E+00
10419790405	576411.13	1.181E+01	2.365E+00	9.282E+00	2.097E+00	1.092E-01	1.991E+00	5.926E-03	1.287E-02	0.000E+00
10419790411	448114.75	1.210E+01	2.375E+00	9.312E+00	2.126E+00	1.102E-01	2.020E+00	5.926E-03	1.287E-02	0.000E+00
10419790417	634493.69	1.253E+01	2.403E+00	9.353E+00	2.168E+00	1.116E-01	2.062E+00	5.926E-03	1.287E-02	0.000E+00
10419790424	523366.25	1.292E+01	2.437E+00	9.399E+00	2.202E+00	1.139E-01	2.100E+00	5.926E-03	1.287E-02	0.000E+00
10419790501	483969.19	1.332E+01	2.490E+00	9.463E+00	2.255E+00	1.181E-01	2.171E+00	8.042E-03	1.287E-02	0.000E+00
10419790509	360482.69	1.361E+01	2.521E+00	9.502E+00	2.295E+00	1.205E-01	2.218E+00	9.618E-03	1.287E-02	0.000E+00
10419790516	298377.94	1.385E+01	2.540E+00	9.533E+00	2.327E+00	1.218E-01	2.258E+00	1.092E-02	1.287E-02	0.000E+00
10419790522	641554.69	1.434E+01	2.604E+00	9.605E+00	2.397E+00	1.246E-01	2.342E+00	1.373E-02	1.287E-02	0.000E+00
10419790529	661021.75	1.483E+01	2.661E+00	9.677E+00	2.470E+00	1.275E-01	2.428E+00	1.662E-02	1.287E-02	0.000E+00
10419790606	372663.88	1.510E+01	2.694E+00	9.718E+00	2.510E+00	1.291E-01	2.477E+00	1.825E-02	1.287E-02	0.000E+00
10419790612	204249.81	1.524E+01	2.712E+00	9.740E+00	2.533E+00	1.300E-01	2.504E+00	1.914E-02	1.287E-02	0.000E+00
10419790619	118744.44	1.532E+01	2.722E+00	9.753E+00	2.546E+00	1.305E-01	2.520E+00	1.966E-02	1.287E-02	0.000E+00
10419790626	57797.07	1.536E+01	2.727E+00	9.760E+00	2.552E+00	1.308E-01	2.527E+00	1.991E-02	1.287E-02	0.000E+00
10419790703	50466.70	1.539E+01	2.732E+00	9.765E+00	2.558E+00	1.310E-01	2.534E+00	2.013E-02	1.287E-02	0.000E+00
10419790710	31663.07	1.542E+01	2.735E+00	9.768E+00	2.561E+00	1.311E-01	2.538E+00	2.027E-02	1.287E-02	0.000E+00
10419790717	14063.02	1.543E+01	2.736E+00	9.770E+00	2.563E+00	1.312E-01	2.540E+00	2.033E-02	1.287E-02	0.000E+00
10419790723	19289.25	1.544E+01	2.737E+00	9.772E+00	2.565E+00	1.313E-01	2.543E+00	2.042E-02	1.287E-02	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10619760714	239676.25	5.533E-02	8.300E+00	1.937E+00	0.000E+00	4.603E+08	2.250E+00	5.533E-01	1.199E-01	7.009E+01	5.810E+00
10619760721	5198.15	5.593E-02	8.580E+00	2.117E+00	0.000E+00	5.002E+08	2.295E+00	5.593E-01	1.223E-01	7.179E+01	5.946E+00
10619760727	1070.45	5.593E-02	8.659E+00	2.183E+00	0.000E+00	5.146E+08	2.303E+00	5.598E-01	1.228E-01	7.218E+01	5.977E+00
10619760803	1101.59	5.610E-02	8.794E+00	2.226E+00	1.231E+06	5.377E+08	2.328E+00	5.602E-01	1.270E-01	7.292E+01	6.041E+00
10619760810	87246.06	8.632E-02	1.349E+01	3.502E+00	2.145E+08	3.127E+09	3.540E+00	5.938E-01	2.210E-01	1.119E+02	1.030E+01
10619760817	10361.78	8.791E-02	1.393E+01	3.665E+00	2.271E+08	3.408E+09	3.639E+00	5.977E-01	2.585E-01	1.153E+02	1.071E+01
10619760824	549.45	8.793E-02	1.407E+01	3.675E+00	2.272E+08	3.421E+09	3.644E+00	5.980E-01	2.592E-01	1.155E+02	1.074E+01
10619760831	65.73	8.793E-02	1.409E+01	3.676E+00	2.272E+08	3.423E+09	3.645E+00	5.980E-01	2.593E-01	1.155E+02	1.074E+01
10619760907	0.00	8.793E-02	1.409E+01	3.676E+00	2.272E+08	3.423E+09	3.645E+00	5.980E-01	2.593E-01	1.155E+02	1.074E+01
10619760916	367.47	8.884E-02	1.410E+01	3.684E+00	2.272E+08	3.439E+09	3.647E+00	5.984E-01	2.603E-01	1.156E+02	1.076E+01
10619760922	2186.82	8.909E-02	1.411E+01	3.732E+00	2.272E+08	3.554E+09	3.670E+00	5.992E-01	2.624E-01	1.166E+02	1.088E+01
10619760928	137.42	8.910E-02	1.412E+01	3.734E+00	2.273E+08	3.564E+09	3.671E+00	5.993E-01	2.625E-01	1.167E+02	1.089E+01
10619761005	43414.14	9.244E-02	1.446E+01	4.219E+00	3.031E+08	7.733E+09	3.951E+00	6.160E-01	3.427E-01	1.310E+02	1.357E+01
10619761012	1556.89	9.256E-02	1.447E+01	4.243E+00	3.061E+08	7.909E+09	3.964E+00	6.166E-01	3.443E-01	1.316E+02	1.367E+01
10619761019	297.32	9.259E-02	1.454E+01	4.249E+00	3.068E+08	7.948E+09	3.966E+00	6.167E-01	3.446E-01	1.317E+02	1.369E+01
10619761026	35703.21	9.259E-02	2.786E+01	5.156E+00	3.941E+08	1.325E+10	4.193E+00	6.305E-01	6.262E-01	1.432E+02	1.696E+01
10619761102	4902.42	9.391E-02	2.913E+01	5.237E+00	4.001E+08	1.362E+10	4.258E+00	6.323E-01	6.430E-01	1.445E+02	1.737E+01
10619761109	1556.88	9.409E-02	2.935E+01	5.249E+00	4.001E+08	1.362E+10	4.268E+00	6.329E-01	6.445E-01	1.448E+02	1.749E+01
10619761115	459.19	9.433E-02	2.936E+01	5.253E+00	4.001E+08	1.362E+10	4.271E+00	6.331E-01	6.453E-01	1.449E+02	1.751E+01
10619761122	36628.60	9.715E-02	3.077E+01	5.591E+00	4.001E+08	1.404E+10	4.512E+00	6.472E-01	7.538E-01	1.534E+02	2.044E+01
10619761130	11403.34	1.015E-01	3.104E+01	5.714E+00	4.068E+08	1.433E+10	4.598E+00	6.560E-01	7.850E-01	1.560E+02	2.133E+01
10619761207	7252.35	2.254E-01	3.137E+01	5.806E+00	4.161E+08	1.462E+10	4.785E+00	7.481E-01	8.302E-01	1.572E+02	2.203E+01
10619761214	50792.73	2.411E-01	3.235E+01	6.275E+00	4.657E+08	1.706E+10	5.092E+00	7.676E-01	1.461E+00	1.697E+02	2.668E+01
10619761220	96554.50	3.005E-01	3.383E+01	6.870E+00	5.315E+08	2.249E+10	5.739E+00	8.048E-01	3.353E+00	1.875E+02	3.348E+01
10619761229	60550.21	3.378E-01	3.477E+01	7.219E+00	5.579E+08	2.630E+10	6.058E+00	8.281E-01	3.579E+00	2.020E+02	3.772E+01
10619770105	6226.82	3.388E-01	3.484E+01	7.257E+00	5.584E+08	2.676E+10	6.093E+00	8.305E-01	3.601E+00	2.032E+02	3.807E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619760714	239676.25	5.165E+00	1.383E+00	7.286E+00	1.937E+00	0.000E+00	1.383E+00	0.000E+00	9.222E-03	0.000E+00
10619760721	5198.15	5.299E+00	1.423E+00	7.556E+00	1.985E+00	0.000E+00	1.415E+00	0.000E+00	9.422E-03	0.000E+00
10619760727	1070.45	5.331E+00	1.434E+00	7.635E+00	1.996E+00	0.000E+00	1.422E+00	0.000E+00	9.464E-03	0.000E+00
10619760803	1101.59	5.369E+00	1.446E+00	7.737E+00	2.010E+00	0.000E+00	1.430E+00	0.000E+00	9.548E-03	0.000E+00
10619760810	87246.06	8.223E+00	2.386E+00	1.553E+01	3.051E+00	0.000E+00	1.934E+00	0.000E+00	1.291E-02	0.000E+00
10619760817	10361.78	8.542E+00	2.490E+00	1.641E+01	3.170E+00	0.000E+00	1.985E+00	0.000E+00	1.291E-02	0.000E+00
10619760824	549.45	8.558E+00	2.495E+00	1.646E+01	3.176E+00	0.000E+00	1.988E+00	0.000E+00	1.291E-02	0.000E+00
10619760831	65.73	8.559E+00	2.496E+00	1.647E+01	3.177E+00	0.000E+00	1.988E+00	0.000E+00	1.291E-02	0.000E+00
10619760907	0.00	8.559E+00	2.496E+00	1.647E+01	3.177E+00	0.000E+00	1.988E+00	0.000E+00	1.291E-02	0.000E+00
10619760916	367.47	8.560E+00	2.499E+00	1.649E+01	3.181E+00	0.000E+00	1.988E+00	0.000E+00	1.291E-02	0.000E+00
10619760922	2186.82	8.620E+00	2.511E+00	1.667E+01	3.208E+00	0.000E+00	1.994E+00	8.415E-05	1.291E-02	0.000E+00
10619760928	137.42	8.623E+00	2.512E+00	1.668E+01	3.210E+00	0.000E+00	1.995E+00	9.472E-05	1.291E-02	0.000E+00
10619761005	43414.14	9.709E+00	2.679E+00	2.059E+01	3.812E+00	0.000E+00	2.179E+00	6.777E-03	1.291E-02	0.000E+00
10619761012	1556.89	9.748E+00	2.687E+00	2.073E+01	3.833E+00	0.000E+00	2.184E+00	6.957E-03	1.291E-02	0.000E+00
10619761019	297.32	9.756E+00	2.688E+00	2.075E+01	3.837E+00	0.000E+00	2.186E+00	6.968E-03	1.291E-02	0.000E+00
10619761026	35703.21	1.065E+01	2.963E+00	2.390E+01	4.332E+00	0.000E+00	2.295E+00	6.968E-03	1.428E-02	0.000E+00
10619761102	4902.42	1.077E+01	3.010E+00	2.433E+01	4.404E+00	1.886E-04	2.311E+00	6.968E-03	1.466E-02	0.000E+00
10619761109	1556.88	1.081E+01	3.027E+00	2.446E+01	4.427E+00	1.886E-04	2.315E+00	7.020E-03	1.470E-02	0.000E+00
10619761115	459.19	1.082E+01	3.032E+00	2.450E+01	4.434E+00	1.886E-04	2.316E+00	7.046E-03	1.481E-02	0.000E+00
10619761122	36628.60	1.169E+01	3.483E+00	2.768E+01	5.012E+00	1.886E-04	2.386E+00	9.864E-03	1.904E-02	0.000E+00
10619761130	11403.34	1.196E+01	3.637E+00	2.866E+01	5.201E+00	1.886E-04	2.400E+00	1.118E-02	2.080E-02	0.000E+00
10619761207	7252.35	1.213E+01	3.749E+00	2.928E+01	5.329E+00	1.886E-04	2.425E+00	1.258E-02	2.247E-02	0.000E+00
10619761214	50792.73	1.326E+01	4.433E+00	3.339E+01	6.150E+00	1.886E-04	2.620E+00	2.039E-02	3.029E-02	0.000E+00
10619761220	96554.50	1.538E+01	5.547E+00	4.067E+01	7.562E+00	1.886E-04	3.141E+00	3.154E-02	3.772E-02	0.000E+00
10619761229	60550.21	1.669E+01	6.130E+00	4.496E+01	8.377E+00	1.886E-04	3.560E+00	3.620E-02	4.003E-02	0.000E+00
10619770105	6226.82	1.682E+01	6.178E+00	4.536E+01	8.454E+00	1.886E-04	3.617E+00	3.692E-02	4.003E-02	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10619770113	87589.13	3.707E-02	2.022E+00	6.067E-01	6.117E+06	5.462E+09	5.460E-01	3.370E-02	9.976E-01	2.056E+01	5.190E+00
10619770119	7535.44	3.707E-02	2.341E+00	6.676E-01	6.380E+06	5.838E+09	5.947E-01	3.660E-02	1.032E+00	2.244E+01	5.735E+00
10619770127	10111.77	3.707E-02	2.614E+00	7.570E-01	6.556E+06	6.247E+09	6.251E-01	4.049E-02	1.062E+00	2.451E+01	6.280E+00
10619770131	2116.56	3.707E-02	2.728E+00	7.798E-01	6.593E+06	6.306E+09	6.340E-01	4.131E-02	1.060E+00	2.495E+01	6.415E+00
10619770207	891.60	3.707E-02	2.844E+00	7.895E-01	7.356E+06	6.328E+09	6.385E-01	4.165E-02	1.070E+00	2.515E+01	6.466E+00
10619770216	5713.75	3.839E-02	4.361E+00	8.532E-01	1.075E+07	6.440E+09	6.976E-01	4.605E-02	1.084E+00	2.717E+01	6.787E+00
10619770224	7031.09	4.272E-02	7.473E+00	9.371E-01	1.271E+07	6.535E+09	8.275E-01	5.687E-02	1.100E+00	3.091E+01	7.169E+00
10619770302	13273.39	5.089E-02	1.544E+01	1.111E+00	1.271E+07	6.641E+09	1.046E+00	6.709E-02	1.133E+00	3.663E+01	7.817E+00
10619770310	71075.00	1.193E-01	2.009E+01	2.259E+00	1.021E+08	7.036E+09	1.544E+00	9.443E-02	1.587E+00	5.221E+01	1.170E+01
10619770317	105914.19	1.722E-01	2.002E+02	4.460E+00	4.164E+08	7.276E+09	2.139E+00	1.352E-01	2.850E+00	7.830E+01	1.643E+01
10619770323	17084.18	1.762E-01	2.033E+02	4.874E+00	4.611E+08	7.316E+09	2.253E+00	1.418E-01	3.016E+00	8.231E+01	1.732E+01
10619770401	14133.65	1.762E-01	2.133E+02	5.255E+00	4.942E+08	7.349E+09	2.345E+00	1.472E-01	3.070E+00	8.546E+01	1.807E+01
10619770406	5618.79	1.775E-01	2.153E+02	5.434E+00	5.050E+08	7.363E+09	2.390E+00	1.494E-01	3.083E+00	8.665E+01	1.835E+01
10619770414	2767.76	1.787E-01	2.220E+02	5.519E+00	5.094E+08	7.371E+09	2.400E+00	1.504E-01	3.089E+00	8.761E+01	1.851E+01
10619770420	208.96	1.787E-01	2.222E+02	5.525E+00	5.096E+08	7.372E+09	2.404E+00	1.505E-01	3.090E+00	8.772E+01	1.852E+01
10619770427	370.31	1.788E-01	2.224E+02	5.540E+00	5.099E+08	7.374E+09	2.411E+00	1.507E-01	3.091E+00	8.801E+01	1.856E+01
10619770504	6169.24	1.797E-01	2.242E+02	5.699E+00	5.111E+08	7.407E+09	2.486E+00	1.531E-01	3.104E+00	9.096E+01	1.898E+01
10619770511	85969.56	1.863E-01	2.335E+02	8.147E+00	5.907E+08	7.789E+09	3.597E+00	1.862E-01	3.295E+00	1.280E+02	2.537E+01
10619770519	9979.57	1.875E-01	2.373E+02	8.466E+00	6.872E+08	7.826E+09	3.667E+00	1.900E-01	3.336E+00	1.316E+02	2.594E+01
10619770526	90893.06	2.015E-01	2.482E+02	1.042E+01	7.580E+08	1.060E+10	4.576E+00	2.280E-01	4.179E+00	1.634E+02	2.923E+01
10619770601	14530.64	2.026E-01	2.576E+02	1.061E+01	7.823E+08	1.139E+10	4.764E+00	2.474E-01	4.303E+00	1.685E+02	2.989E+01
10619770607	5637.20	2.026E-01	2.638E+02	1.071E+01	7.899E+08	1.156E+10	4.808E+00	2.517E-01	4.317E+00	1.707E+02	3.016E+01
10619770614	3497.68	2.026E-01	2.650E+02	1.079E+01	7.935E+08	1.158E+10	4.834E+00	2.530E-01	4.321E+00	1.721E+02	3.035E+01
10619770621	2530.56	2.026E-01	2.656E+02	1.087E+01	7.994E+08	1.161E+10	4.858E+00	2.540E-01	4.325E+00	1.733E+02	3.048E+01
10619770629	896.25	2.026E-01	2.657E+02	1.091E+01	8.027E+08	1.163E+10	4.871E+00	2.544E-01	4.327E+00	1.736E+02	3.062E+01
10619770706	8426.00	2.026E-01	2.675E+02	1.127E+01	8.173E+08	1.182E+10	4.939E+00	2.576E-01	4.412E+00	1.769E+02	3.180E+01
10619770713	29733.96	2.026E-01	2.793E+02	1.240E+01	8.188E+08	1.265E+10	5.467E+00	2.690E-01	4.858E+00	1.911E+02	3.531E+01
10619770721	755.34	2.026E-01	2.793E+02	1.243E+01	8.191E+08	1.268E+10	5.477E+00	2.693E-01	4.869E+00	1.914E+02	3.560E+01
10619770726	0.00	2.026E-01	2.793E+02	1.243E+01	8.191E+08	1.268E+10	5.477E+00	2.693E-01	4.869E+00	1.914E+02	3.560E+01
10619770802	0.00	2.026E-01	2.793E+02	1.243E+01	8.191E+08	1.268E+10	5.477E+00	2.693E-01	4.869E+00	1.914E+02	3.560E+01
10619770810	0.00	2.026E-01	2.793E+02	1.243E+01	8.191E+08	1.268E+10	5.477E+00	2.693E-01	4.869E+00	1.914E+02	3.560E+01
10619770817	2586.53	2.063E-01	2.794E+02	1.248E+01	8.236E+08	1.284E+10	5.502E+00	2.723E-01	4.880E+00	1.919E+02	3.586E+01
10619770822	97545.13	2.063E-01	2.817E+02	1.432E+01	6.444E+09	1.522E+10	6.133E+00	3.099E-01	5.180E+00	2.133E+02	4.637E+01
10619770830	3131.89	2.071E-01	2.825E+02	1.438E+01	6.579E+09	1.528E+10	6.157E+00	3.111E-01	5.196E+00	2.141E+02	4.664E+01
10619770906	31.75	2.072E-01	2.825E+02	1.438E+01	6.580E+09	1.528E+10	6.157E+00	3.111E-01	5.196E+00	2.141E+02	4.665E+01
10619770913	260760.19	2.573E-01	3.247E+02	2.171E+01	6.580E+09	1.531E+10	8.123E+00	4.114E-01	6.802E+00	2.763E+02	6.440E+01
10619770920	6072.59	2.597E-01	3.272E+02	2.181E+01	6.594E+09	1.538E+10	8.176E+00	4.138E-01	6.820E+00	2.781E+02	6.490E+01
10619770927	2047.24	2.597E-01	3.275E+02	2.187E+01	6.608E+09	1.542E+10	8.193E+00	4.145E-01	6.826E+00	2.787E+02	6.505E+01
10619771004	340.49	2.597E-01	3.275E+02	2.189E+01	6.611E+09	1.543E+10	8.196E+00	4.147E-01	6.827E+00	2.788E+02	6.507E+01
10619771011	10.89	2.597E-01	3.275E+02	2.189E+01	6.611E+09	1.543E+10	8.196E+00	4.147E-01	6.827E+00	2.788E+02	6.507E+01
10619771018	104521.19	2.677E-01	3.296E+02	2.193E+01	6.745E+09	1.645E+10	8.804E+00	4.549E-01	6.947E+00	3.005E+02	7.388E+01
10619771025	4176.36	2.693E-01	3.298E+02	2.195E+01	6.750E+09	1.648E+10	8.822E+00	4.565E-01	6.951E+00	3.015E+02	7.421E+01
10619771103	260017.50	3.294E-01	3.328E+02	2.505E+01	7.022E+09	1.725E+10	1.078E+01	5.566E-01	8.131E+00	3.535E+02	9.222E+01
10619771108	162510.94	4.544E-01	3.372E+02	2.637E+01	7.186E+09	1.786E+10	1.208E+01	6.191E-01	1.025E+01	3.885E+02	1.024E+02
10619771115	105098.13	5.313E-01	3.417E+02	2.701E+01	7.291E+09	1.830E+10	1.304E+01	7.404E-01	1.217E+01	4.112E+02	1.076E+02
10619771122	7813.38	5.440E-01	3.422E+02	2.714E+01	7.297E+09	1.833E+10	1.311E+01	7.464E-01	1.225E+01	4.129E+02	1.080E+02
10619771129	6120.67	5.570E-01	3.426E+02	2.730E+01	7.300E+09	1.836E+10	1.314E+01	7.488E-01	1.226E+01	4.143E+02	1.084E+02
10619771206	9643.55	5.589E-01	3.431E+02	2.748E+01	7.305E+09	1.843E+10	1.320E+01	7.525E-01	1.227E+01	4.162E+02	1.090E+02
10619771212	10613.81	5.617E-01	3.439E+02	2.762E+01	7.313E+09	1.852E+10	1.326E+01	7.566E-01	1.227E+01	4.184E+02	1.097E+02
10619771220	14535.61	5.774E-01	3.445E+02	2.778E+01	7.324E+09	1.863E+10	1.336E+01	7.622E-01	1.228E+01	4.216E+02	1.106E+02
10619771230	40685.20	6.242E-01	3.449E+02	2.823E+01	7.364E+09	1.887E+10	1.368E+01	7.809E-01	1.235E+01	4.347E+02	1.142E+02
10519780105	142272.50	7.666E-01	3.498E+02	2.933E+01	7.496E+09	1.917E+10	1.449E+01	8.356E-01	1.253E+01	4.654E+02	1.228E+02

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619770113	87589.13	1.786E+00	6.741E-01	5.494E+00	9.774E-01	0.000E+00	6.741E-01	6.741E-03	0.000E+00	0.000E+00
10619770119	7535.44	1.931E+00	7.321E-01	5.952E+00	1.050E+00	0.000E+00	7.205E-01	7.031E-03	0.000E+00	0.000E+00
10619770127	10111.77	2.118E+00	8.099E-01	6.551E+00	1.139E+00	0.000E+00	7.710E-01	7.420E-03	0.000E+00	0.000E+00
10619770131	2116.56	2.155E+00	8.270E-01	6.672E+00	1.156E+00	0.000E+00	7.792E-01	7.501E-03	0.000E+00	0.000E+00
10619770207	841.60	2.171E+00	8.349E-01	6.723E+00	1.162E+00	0.000E+00	7.823E-01	7.570E-03	0.000E+00	0.000E+00
10619770216	5713.75	2.281E+00	8.986E-01	7.020E+00	1.208E+00	0.000E+00	8.416E-01	7.790E-03	0.000E+00	0.000E+00
10619770224	7031.09	2.433E+00	1.001E+00	7.339E+00	1.271E+00	0.000E+00	9.796E-01	8.060E-03	2.705E-04	0.000E+00
10619770302	13273.39	2.754E+00	1.241E+00	7.870E+00	1.403E+00	0.000E+00	1.352E+00	8.571E-03	1.803E-03	0.000E+00
10619770310	71075.00	4.642E+00	2.554E+00	1.061E+01	2.087E+00	0.000E+00	3.240E+00	1.131E-02	7.273E-03	0.000E+00
10619770317	105914.19	7.780E+00	4.551E+00	1.448E+01	3.065E+00	0.000E+00	5.848E+00	1.538E-02	1.135E-02	0.000E+00
10619770323	17084.18	8.332E+00	4.880E+00	1.508E+01	3.216E+00	0.000E+00	6.242E+00	1.604E-02	1.135E-02	0.000E+00
10619770401	14133.65	8.821E+00	5.157E+00	1.555E+01	3.336E+00	0.000E+00	6.547E+00	1.658E-02	1.135E-02	0.000E+00
10619770406	5618.79	9.038E+00	5.272E+00	1.573E+01	3.379E+00	0.000E+00	6.657E+00	1.680E-02	1.135E-02	0.000E+00
10619770414	2767.76	9.149E+00	5.329E+00	1.582E+01	3.400E+00	0.000E+00	6.708E+00	1.691E-02	1.135E-02	0.000E+00
10619770420	208.96	9.159E+00	5.334E+00	1.582E+01	3.401E+00	0.000E+00	6.712E+00	1.691E-02	1.135E-02	0.000E+00
10619770427	570.31	9.185E+00	5.346E+00	1.584E+01	3.405E+00	0.000E+00	6.721E+00	1.694E-02	1.135E-02	0.000E+00
10619770504	6169.24	9.494E+00	5.486E+00	1.601E+01	3.448E+00	0.000E+00	6.813E+00	1.741E-02	1.135E-02	0.000E+00
10619770511	85969.56	1.379E+01	7.173E+00	1.899E+01	4.076E+00	0.000E+00	8.170E+00	2.072E-02	2.458E-02	0.000E+00
10619770519	9979.57	1.429E+01	7.338E+00	1.941E+01	4.153E+00	0.000E+00	8.335E+00	2.110E-02	2.765E-02	0.000E+00
10619770526	90893.06	1.884E+01	8.527E+00	2.395E+01	4.922E+00	0.000E+00	9.944E+00	2.460E-02	7.312E-02	0.000E+00
10619770601	14530.64	1.957E+01	8.678E+00	2.479E+01	5.062E+00	0.000E+00	1.022E+01	2.572E-02	8.374E-02	0.000E+00
10619770607	5637.20	1.985E+01	8.750E+00	2.520E+01	5.123E+00	0.000E+00	1.031E+01	2.593E-02	8.721E-02	0.000E+00
10619770614	3497.68	2.003E+01	8.803E+00	2.550E+01	5.165E+00	0.000E+00	1.035E+01	2.593E-02	8.896E-02	0.000E+00
10619770621	2530.56	2.016E+01	8.847E+00	2.576E+01	5.199E+00	0.000E+00	1.038E+01	2.593E-02	8.994E-02	0.000E+00
10619770629	896.25	2.021E+01	8.866E+00	2.587E+01	5.212E+00	0.000E+00	1.038E+01	2.593E-02	9.018E-02	0.000E+00
10619770706	8426.00	2.066E+01	9.073E+00	2.703E+01	5.358E+00	6.484E-04	1.041E+01	2.593E-02	9.180E-02	0.000E+00
10619770713	29738.96	2.219E+01	9.737E+00	3.095E+01	5.850E+00	1.793E-03	1.050E+01	2.593E-02	9.638E-02	0.000E+00
10619770721	755.34	2.223E+01	9.752E+00	3.104E+01	5.862E+00	1.793E-03	1.051E+01	2.593E-02	9.646E-02	0.000E+00
10619770726	0.00	2.223E+01	9.752E+00	3.104E+01	5.862E+00	1.793E-03	1.051E+01	2.593E-02	9.646E-02	0.000E+00
10619770802	0.00	2.223E+01	9.752E+00	3.104E+01	5.862E+00	1.793E-03	1.051E+01	2.593E-02	9.646E-02	0.000E+00
10619770810	0.00	2.223E+01	9.752E+00	3.104E+01	5.862E+00	1.793E-03	1.051E+01	2.593E-02	9.646E-02	0.000E+00
10619770817	2586.53	2.234E+01	9.782E+00	3.129E+01	5.895E+00	1.793E-03	1.051E+01	2.593E-02	9.666E-02	0.000E+00
10619770822	97545.13	2.609E+01	1.072E+01	4.019E+01	7.058E+00	1.793E-03	1.074E+01	2.593E-02	1.042E-01	0.000E+00
10619770830	3131.89	2.620E+01	1.075E+01	4.046E+01	7.095E+00	1.793E-03	1.074E+01	2.593E-02	1.044E-01	0.000E+00
10619770906	31.75	2.621E+01	1.075E+01	4.046E+01	7.095E+00	1.793E-03	1.074E+01	2.593E-02	1.044E-01	0.000E+00
10619770913	260760.19	3.323E+01	1.135E+01	5.682E+01	9.503E+00	3.189E-02	1.125E+01	4.600E-02	1.245E-01	0.000E+00
10619770920	6072.59	3.341E+01	1.136E+01	5.721E+01	9.559E+00	3.213E-02	1.126E+01	4.624E-02	1.247E-01	0.000E+00
10619770927	2047.24	3.348E+01	1.136E+01	5.734E+01	9.578E+00	3.213E-02	1.126E+01	4.624E-02	1.247E-01	0.000E+00
10619771004	340.49	3.349E+01	1.136E+01	5.736E+01	9.581E+00	3.213E-02	1.126E+01	4.624E-02	1.247E-01	0.000E+00
10619771011	10.89	3.349E+01	1.136E+01	5.736E+01	9.581E+00	3.213E-02	1.126E+01	4.624E-02	1.247E-01	0.000E+00
10619771018	104521.19	3.659E+01	1.140E+01	6.384E+01	1.051E+01	3.213E-02	1.151E+01	4.624E-02	1.408E-01	0.000E+00
10619771025	4176.36	3.670E+01	1.140E+01	6.409E+01	1.054E+01	3.229E-02	1.152E+01	4.640E-02	1.418E-01	0.000E+00
10619771103	260017.50	4.200E+01	1.140E+01	7.910E+01	1.274E+01	5.230E-02	1.222E+01	6.641E-02	2.318E-01	0.000E+00
10619771108	162510.94	4.543E+01	1.140E+01	8.547E+01	1.368E+01	6.481E-02	1.253E+01	7.266E-02	2.693E-01	0.000E+00
10619771115	105098.13	4.668E+01	1.140E+01	8.831E+01	1.413E+01	7.289E-02	1.265E+01	7.266E-02	2.855E-01	0.000E+00
10619771122	7013.38	4.673E+01	1.140E+01	8.862E+01	1.414E+01	7.380E-02	1.265E+01	7.266E-02	2.864E-01	0.000E+00
10619771129	6120.67	4.674E+01	1.140E+01	8.863E+01	1.414E+01	7.497E-02	1.265E+01	7.266E-02	2.869E-01	0.000E+00
10619771206	96[illegible]3.55	4.701E+01	1.141E+01	8.915E+01	1.424E+01	7.534E-02	1.268E+01	7.303E-02	2.876E-01	0.000E+00
10619771212	10613.81	4.732E+01	1.142E+01	8.973E+01	1.435E+01	7.534E-02	1.272E+01	7.344E-02	2.880E-01	0.000E+00
10619771220	14535.61	4.776E+01	1.142E+01	9.052E+01	1.449E+01	7.534E-02	1.276E+01	7.400E-02	2.886E-01	0.000E+00
10619771230	48685.20	4.930E+01	1.142E+01	9.318E+01	1.498E+01	7.534E-02	1.293E+01	7.775E-02	2.905E-01	0.000E+00
10619780105	142272.50	5.411E+01	1.142E+01	1.011E+02	1.651E+01	7.534E-02	1.359E+01	9.964E-02	2.959E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10619780110	13188.98	1.522E-03	1.827E+00	1.015E-01	1.934E+07	4.771E+08	1.015E-02	5.075E-03	2.334E-02	3.146E+00	6.953E-01
10619780117	134842.38	3.388E-01	1.480E+01	1.191E+00	2.783E+08	9.188E+09	4.304E-01	2.126E-01	5.526E-01	3.013E+01	5.261E+00
10619780124	267016.38	1.037E+00	4.357E+01	3.246E+00	5.394E+08	2.550E+10	1.407E+00	1.240E+00	2.196E+00	6.609E+01	1.060E+01
10619780131	92256.81	1.169E+00	4.499E+01	3.991E+00	5.442E+08	3.082E+10	2.141E+00	1.524E+00	2.899E+00	8.277E+01	1.337E+01
10619780207	10848.96	1.175E+00	4.653E+01	4.088E+00	5.489E+08	3.208E+10	2.238E+00	1.549E+00	2.943E+00	8.528E+01	1.394E+01
10619780216	15820.55	1.179E+00	5.773E+01	4.246E+00	5.622E+08	3.484E+10	2.313E+00	1.567E+00	2.971E+00	8.765E+01	1.464E+01
10619780224	14446.71	1.184E+00	6.051E+01	4.435E+00	5.685E+08	3.621E+10	2.385E+00	1.573E+00	2.991E+00	8.954E+01	1.528E+01
10619780228	8491.08	1.190E+00	6.153E+01	4.575E+00	5.694E+08	3.642E+10	2.432E+00	1.579E+00	3.002E+00	9.065E+01	1.563E+01
10619780308	68265.19	1.359E+00	6.468E+01	5.652E+00	5.765E+08	3.763E+10	2.624E+00	1.658E+00	3.131E+00	1.019E+02	1.854E+01
10619780314	78908.88	1.705E+00	8.472E+01	6.867E+00	5.889E+08	3.798E+10	3.116E+00	1.780E+00	3.361E+00	1.126E+02	2.182E+01
10619780321	29181.61	1.706E+00	9.550E+01	7.496E+00	5.976E+08	3.807E+10	3.301E+00	1.791E+00	3.425E+00	1.190E+02	2.295E+01
10619780329	33952.90	1.774E+00	9.733E+01	8.489E+00	6.136E+08	3.814E+10	3.565E+00	1.843E+00	3.517E+00	1.309E+02	2.431E+01
10619780405	16610.19	1.775E+00	1.586E+02	8.910E+00	6.264E+08	3.827E+10	3.602E+00	1.869E+00	3.563E+00	1.509E+02	2.505E+01
10619780412	10125.99	1.776E+00	1.808E+02	9.136E+00	6.370E+08	3.841E+10	3.759E+00	1.896E+00	3.593E+00	1.603E+02	2.551E+01
10619780419	22091.47	1.779E+00	1.962E+02	9.570E+00	6.663E+08	3.883E+10	4.392E+00	1.998E+00	3.662E+00	1.751E+02	2.655E+01
10619780425	17787.97	1.821E+00	2.068E+02	9.953E+00	7.150E+08	3.909E+10	4.579E+00	2.005E+00	3.682E+00	1.802E+02	2.728E+01
10619780427	51875.05	2.043E+00	2.164E+02	1.115E+01	9.197E+08	3.961E+10	6.360E+00	2.025E+00	4.135E+00	1.908E+02	2.840E+01
10619780502	114707.38	2.537E+00	2.300E+02	1.309E+01	1.420E+09	4.059E+10	7.252E+00	2.069E+00	4.260E+00	2.115E+02	3.135E+01
10619780510	107950.19	2.607E+00	2.517E+02	1.655E+01	1.709E+09	4.132E+10	9.204E+00	2.111E+00	4.600E+00	2.315E+02	3.476E+01
10619780516	100737.13	2.658E+00	2.750E+02	1.922E+01	1.709E+09	4.173E+10	1.066E+01	2.149E+00	4.705E+00	2.598E+02	3.833E+01
10619780522	12951.69	2.680E+00	2.773E+02	1.952E+01	1.710E+09	4.177E+10	1.019E+01	2.154E+00	4.724E+00	2.639E+02	3.884E+01
10619780529	1486.09	2.684E+00	2.780E+02	1.956E+01	1.710E+09	4.178E+10	1.021E+01	2.155E+00	4.727E+00	2.645E+02	3.891E+01
10619780606	40368.91	2.691E+00	2.957E+02	2.049E+01	1.719E+09	4.199E+10	1.056E+01	2.170E+00	4.798E+00	2.916E+02	4.026E+01
10619780614	7326.66	2.700E+00	2.965E+02	2.067E+01	1.720E+09	4.204E+10	1.077E+01	2.173E+00	4.823E+00	2.984E+02	4.055E+01
10619780620	1040.70	2.708E+00	2.967E+02	2.071E+01	1.720E+09	4.205E+10	1.078E+01	2.174E+00	4.824E+00	2.989E+02	4.060E+01
10619780628	46.41	2.708E+00	2.967E+02	2.071E+01	1.721E+09	4.205E+10	1.078E+01	2.174E+00	4.824E+00	2.989E+02	4.060E+01
10619780705	1027.36	2.708E+00	2.969E+02	2.075E+01	1.722E+09	4.206E+10	1.079E+01	2.176E+00	4.828E+00	2.994E+02	4.069E+01
10619780712	290.55	2.709E+00	2.971E+02	2.075E+01	1.722E+09	4.206E+10	1.080E+01	2.177E+00	4.829E+00	2.995E+02	4.071E+01
10619780718	608.97	2.709E+00	2.973E+02	2.076E+01	1.726E+09	4.206E+10	1.081E+01	2.178E+00	4.831E+00	2.997E+02	4.073E+01
10619780725	133.81	2.709E+00	2.973E+02	2.077E+01	1.727E+09	4.206E+10	1.081E+01	2.178E+00	4.832E+00	2.998E+02	4.076E+01
10619780801	9633.43	2.714E+00	3.035E+02	2.095E+01	1.814E+09	4.214E+10	1.091E+01	2.185E+00	4.873E+00	3.016E+02	4.132E+01
10619780808	329.09	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780814	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780823	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780829	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780905	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780912	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780919	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619780926	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781003	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781010	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781017	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781025	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781031	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781109	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781114	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781121	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781128	0.00	2.714E+00	3.085E+02	2.096E+01	1.817E+09	4.215E+10	1.091E+01	2.187E+00	4.873E+00	3.017E+02	4.134E+01
10619781205	8151.54	2.724E+00	3.090E+02	2.106E+01	1.861E+09	4.264E+10	1.094E+01	2.215E+00	4.891E+00	3.017E+02	4.196E+01
10619781213	3236.64	2.726E+00	3.178E+02	2.111E+01	1.878E+09	4.284E+10	1.102E+01	2.232E+00	4.896E+00	3.017E+02	4.218E+01
10619781219	8175.24	2.728E+00	3.346E+02	2.120E+01	1.890E+09	4.335E+10	1.119E+01	2.264E+00	4.907E+00	3.017E+02	4.249E+01
10619781228	72849.44	2.784E+00	5.897E+02	2.277E+01	1.890E+09	5.251E+10	1.200E+01	2.573E+00	5.022E+00	3.017E+02	4.645E+01
10619790104	69886.13	2.832E+00	6.354E+02	2.395E+01	1.890E+09	6.177E+10	1.310E+01	2.680E+00	5.129E+00	3.017E+02	4.978E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619780110	13188.98	4.517E-01	0.000E+00	7.460E-01	1.421E-01	0.000E+00	6.597E-02	1.522E-03	5.075E-04	0.000E+00
10619780117	134842.38	5.070E+00	0.000E+00	8.477E+00	1.595E+00	0.000E+00	7.924E-01	1.190E-02	5.696E-03	0.000E+00
10619780124	267016.38	1.432E+01	0.000E+00	2.409E+01	4.472E+00	0.000E+00	2.334E+00	2.217E-02	1.597E-02	0.000E+00
10619780131	92256.81	1.755E+01	0.000E+00	2.960E+01	5.466E+00	0.000E+00	2.937E+00	2.572E-02	1.952E-02	0.000E+00
10619780207	10848.96	1.794E+01	0.000E+00	3.026E+01	5.583E+00	4.175E-04	3.021E+00	2.656E-02	2.077E-02	0.000E+00
10619780216	15820.55	1.844E+01	4.870E-02	3.117E+01	5.741E+00	1.026E-03	3.124E+00	2.778E-02	2.199E-02	0.000E+00
10619780224	14446.71	1.881E+01	1.543E-01	3.192E+01	5.874E+00	2.138E-03	3.202E+00	2.889E-02	2.310E-02	0.000E+00
10619780228	8491.08	1.899E+01	2.523E-01	3.231E+01	5.946E+00	3.118E-03	3.238E+00	2.954E-02	2.376E-02	0.000E+00
10619780308	68265.19	2.025E+01	1.190E+00	3.536E+01	6.524E+00	1.625E-02	3.500E+00	3.742E-02	3.164E-02	0.000E+00
10619780314	78908.86	2.204E+01	2.230E+00	3.928E+01	7.283E+00	2.840E-02	4.533E+00	4.653E-02	4.378E-02	0.000E+00
10619780321	29181.61	2.279E+01	2.590E+00	4.083E+01	7.598E+00	3.177E-02	5.117E+00	4.990E-02	4.827E-02	0.000E+00
10619780329	33952.90	2.379E+01	2.995E+00	4.279E+01	8.003E+00	3.438E-02	6.083E+00	5.382E-02	5.481E-02	0.000E+00
10619780405	16610.19	2.435E+01	3.186E+00	4.383E+01	8.233E+00	3.566E-02	6.723E+00	5.638E-02	5.928E-02	0.000E+00
10619780412	10125.99	2.467E+01	3.280E+00	4.452E+01	8.365E+00	3.605E-02	7.101E+00	5.754E-02	6.123E-02	0.000E+00
10619780419	22091.47	2.533E+01	3.433E+00	4.614E+01	8.637E+00	3.690E-02	7.908E+00	5.924E-02	6.463E-02	0.000E+00
10619780425	17787.97	2.584E+01	3.522E+00	4.753E+01	8.843E+00	3.758E-02	8.545E+00	5.993E-02	6.668E-02	0.000E+00
10619780427	51875.05	2.724E+01	3.702E+00	5.180E+01	9.401E+00	3.958E-02	1.036E+01	6.193E-02	7.067E-02	0.000E+00
10619780502	114707.38	3.033E+01	4.055E+00	6.142E+01	1.064E+01	4.841E-02	1.433E+01	7.075E-02	7.950E-02	0.000E+00
10619780510	107950.19	3.320E+01	4.387E+00	7.060E+01	1.180E+01	5.256E-02	1.799E+01	7.906E-02	8.781E-02	0.000E+00
10619780516	100737.13	3.611E+01	4.697E+00	7.940E+01	1.292E+01	5.644E-02	2.132E+01	8.681E-02	9.556E-02	0.000E+00
10619780522	12951.69	3.647E+01	4.737E+00	8.055E+01	1.307E+01	5.693E-02	2.174E+01	8.781E-02	9.656E-02	0.000E+00
10619780529	1486.09	3.652E+01	4.742E+00	8.069E+01	1.309E+01	5.699E-02	2.179E+01	8.792E-02	9.667E-02	0.000E+00
10619780606	40368.91	3.773E+01	4.897E+00	8.445E+01	1.362E+01	6.010E-02	2.306E+01	9.258E-02	1.013E-01	0.000E+00
10619780614	7326.56	3.796E+01	4.917E+00	8.510E+01	1.371E+01	6.038E-02	2.326E+01	9.315E-02	1.025E-01	0.000E+00
10619780620	1040.70	3.799E+01	4.918E+00	8.519E+01	1.372E+01	6.042E-02	2.328E+01	9.323E-02	1.027E-01	0.000E+00
10619780628	46.41	3.799E+01	4.918E+00	8.520E+01	1.372E+01	6.042E-02	2.328E+01	9.323E-02	1.027E-01	0.000E+00
10619780705	1027.36	3.802E+01	4.918E+00	8.520E+01	1.373E+01	6.050E-02	2.330E+01	9.335E-02	1.030E-01	0.000E+00
10619780712	290.55	3.803E+01	4.918E+00	8.531E+01	1.374E+01	6.051E-02	2.331E+01	9.339E-02	1.031E-01	0.000E+00
10619780718	608.07	3.806E+01	4.919E+00	8.536E+01	1.375E+01	6.053E-02	2.332E+01	9.354E-02	1.032E-01	0.000E+00
10619780725	133.81	3.806E+01	4.920E+00	8.538E+01	1.376E+01	6.054E-02	2.333E+01	9.357E-02	1.032E-01	0.000E+00
10619780801	9835.43	3.846E+01	4.958E+00	8.652E+01	1.393E+01	6.130E-02	2.376E+01	9.736E-02	1.051E-01	0.000E+00
10619780808	329.09	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780814	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780823	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780829	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780905	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780912	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780919	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619780926	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781003	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781010	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781017	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781025	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781031	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781109	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781114	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781121	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781128	0.00	3.847E+01	4.959E+00	8.656E+01	1.394E+01	6.131E-02	2.378E+01	9.747E-02	1.052E-01	0.000E+00
10619781205	8151.54	3.876E+01	5.015E+00	8.710E+01	1.406E+01	6.131E-02	2.381E+01	9.872E-02	1.074E-01	0.000E+00
10619781213	3236.64	3.887E+01	5.049E+00	8.730E+01	1.410E+01	6.131E-02	2.383E+01	9.910E-02	1.081E-01	0.000E+00
10619781219	5175.24	3.904E+01	5.125E+00	8.760E+01	1.416E+01	6.151E-02	2.387E+01	9.950E-02	1.091E-01	0.000E+00
10619781228	72849.44	4.131E+01	6.414E+00	9.147E+01	1.492E+01	6.711E-02	2.454E+01	1.023E-01	1.231E-01	0.000E+00
10619790104	69886.13	4.338E+01	8.027E+00	9.477E+01	1.556E+01	7.787E-02	2.540E+01	1.077E-01	1.366E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10619790116	138350.81	1.650E-01	1.496E+02	1.757E+00	0.000E+00	1.549E+10	1.209E+00	2.130E-01	3.727E-01	0.000E+00	3.248E+00
10619790123	31391.38	1.747E-01	1.938E+02	2.107E+00	0.000E+00	1.707E+10	1.733E+00	2.371E-01	4.415E-01	0.000E+00	4.311E+00
10619790130	34009.68	1.917E-01	1.989E+02	2.356E+00	0.000E+00	1.920E+10	2.238E+00	2.895E-01	5.122E-01	0.000E+00	5.842E+00
10619790206	15847.16	1.935E-01	2.021E+02	2.417E+00	0.000E+00	1.925E+10	2.370E+00	3.017E-01	5.128E-01	0.000E+00	6.634E+00
10619790213	20292.45	2.084E-01	2.186E+02	2.534E+00	1.701E+07	1.932E+10	2.621E+00	3.173E-01	5.261E-01	0.000E+00	7.657E+00
10619790222	41601.98	2.836E-01	2.870E+02	2.854E+00	8.746E+07	1.951E+10	2.970E+00	3.493E-01	5.629E-01	0.000E+00	9.706E+00
10619790227	127725.13	5.883E-01	4.433E+02	4.181E+00	4.442E+08	2.020E+10	5.270E+00	4.967E-01	8.479E-01	0.000E+00	1.516E+01
10619790307	51710.60	5.883E-01	4.648E+02	4.818E+00	5.327E+08	2.041E+10	5.580E+00	5.166E-01	9.236E-01	0.000E+00	1.705E+01
10619790313	63482.71	5.883E-01	4.863E+02	5.844E+00	5.327E+08	2.055E+10	5.950E+00	5.411E-01	1.024E+00	0.000E+00	1.949E+01
10619790320	14184.71	5 927E-01	5.129E+02	6.133E+00	5.327E+08	2.056E+10	6.092E+00	5.520E-01	1.043E+00	0.000E+00	2.016E+01
10619790327	5034.19	5.929E-01	5.180E+02	6.261E+00	5.327E+08	2.056E+10	6.134E+00	5.539E-01	1.050E+00	0.000E+00	2.042E+01
10619790405	3196.67	5.938E-01	5.231E+02	6.333E+00	5.327E+08	2.056E+10	6.169E+00	5.551E-01	1.054E+00	0.000E+00	2.059E+01
10619790411	6593.41	5.938E-01	5.244E+02	6.463E+00	5.327E+08	2.058E+10	6.230E+00	5.577E-01	1.061E+00	0.000E+00	2.090E+01
10619790417	103146.31	5.938E-01	7.109E+02	8.527E+00	5.327E+08	2.083E+10	7.619E+00	5.974E-01	1.243E+00	0.000E+00	2.479E+01
10619790424	6298.00	5.938E-01	7.388E+02	8.658E+00	5.327E+08	2.085E+10	7.693E+00	5.998E-01	1.262E+00	0.000E+00	2.500E+01
10619790501	24542.67	6.221E-01	7.424E+02	9.130E+00	5.340E+08	2.094E+10	8.274E+00	6.092E-01	1.307E+00	0.000E+00	2.598E+01
10619790508	7578.79	6.302E-01	7.430E+02	9.267E+00	5.349E+08	2.098E+10	8.479E+00	6.121E-01	1.317E+00	0.000E+00	2.631E+01
10619790516	6152.25	6.414E-01	7.438E+02	9.373E+00	5.359E+08	2.100E+10	8.618E+00	6.145E-01	1.324E+00	0.000E+00	2.660E+01
10619790522	14335.30	6.441E-01	7.458E+02	9.616E+00	5.392E+08	2.104E+10	8.769E+00	6.200E-01	1.332E+00	0.000E+00	2.722E+01
10619790529	16410.01	6.574E-01	7.490E+02	1.014E+01	5.463E+08	2.111E+10	8.995E+00	6.390E-01	1.344E+00	0.000E+00	2.792E+01
10619790606	7915.52	6.592E-01	7.524E+02	1.054E+01	5.518E+08	2.116E+10	9.104E+00	6.451E-01	1.409E+00	0.000E+00	2.840E+01
10619790612	665.26	6.593E-01	7.528E+02	1.056E+01	5.712E+08	2.117E+10	9.115E+00	6.463E-01	1.413E+00	0.000E+00	2.844E+01
10619790619	211.12	6.664E-01	7.529E+02	1.057E+01	5.818E+08	2.117E+10	9.118E+00	6.467E-01	1.414E+00	0.000E+00	2.845E+01
10619790626	0.00	6.664E-01	7.529E+02	1.057E+01	5.818E+08	2.117E+10	9.118E+00	6.467E-01	1.414E+00	0.000E+00	2.845E+01
10619790703	0.00	6.664E-01	7.529E+02	1.057E+01	5.818E+08	2.117E+10	9.118E+00	6.467E-01	1.414E+00	0.000E+00	2.845E+01
10619790710	0.00	6.664E-01	7.529E+02	1.057E+01	5.818E+08	2.117E+10	9.118E+00	6.467E-01	1.414E+00	0.000E+00	2.845E+01
10619790717	3792.43	6.736E-01	7.550E+02	1.063E+01	1.150E+09	2.124E+10	9.172E+00	6.525E-01	1.417E+00	0.000E+00	2.867E+01
10619790723	73236.81	6.746E-01	7.570E+02	1.128E+01	1.393E+10	2.267E+10	9.975E+00	7.371E-01	1.524E+00	0.000E+00	3.329E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10619790116	138350.81	4.579E+00	2.130E+00	8.944E+00	1.597E+00	2.662E-02	2.236E+00	2.130E-02	2.662E-02	0.000E+00
10619790123	31391.38	5.678E+00	2.468E+00	1.129E+01	1.996E+00	3.266E-02	2.816E+00	2.734E-02	3.266E-02	0.000E+00
10619790130	34009.68	6.934E+00	2.677E+00	1.418E+01	2.467E+00	4.051E-02	3.523E+00	3.519E-02	3.920E-02	0.000E+00
10619790206	15847.16	7.556E+00	2.714E+00	1.570E+01	2.717E+00	4.539E-02	3.880E+00	4.060E-02	4.286E-02	0.000E+00
10619790213	20292.45	8.274E+00	2.776E+00	1.737E+01	2.990E+00	5.320E-02	4.294E+00	4.614E-02	5.223E-02	0.000E+00
10619790222	41601.98	9.603E+00	2.936E+00	2.023E+01	3.470E+00	7.241E-02	4.999E+00	5.414E-02	8.105E-02	0.000E+00
10619790227	127725.13	1.309E+01	3.575E+00	2.687E+01	4.601E+00	1.461E-01	6.719E+00	6.889E-02	2.088E-01	0.000E+00
10619790307	51710.60	1.439E+01	3.874E+00	2.910E+01	4.999E+00	1.890E-01	7.336E+00	7.287E-02	2.703E-01	0.000E+00
10619790313	63482.71	1.614E+01	4.240E+00	3.323E+01	5.561E+00	2.166E-01	8.191E+00	7.775E-02	3.340E-01	0.000E+00
10619790320	14184.71	1.656E+01	4.322E+00	3.438E+01	5.697E+00	2.237E-01	8.398E+00	7.885E-02	3.460E-01	0.000E+00
10619790327	5034.19	1.673E+01	4.351E+00	3.489E+01	5.751E+00	2.258E-01	8.478E+00	7.923E-02	3.495E-01	0.000E+00
10619790405	3196.67	1.684E+01	4.369E+00	3.527E+01	5.789E+00	2.269E-01	8.532E+00	7.948E-02	3.512E-01	0.000E+00
10619790411	6593.41	1.708E+01	4.408E+00	3.623E+01	5.881E+00	2.290E-01	8.656E+00	8.024E-02	3.538E-01	0.000E+00
10619790417	103146.31	2.121E+01	5.003E+00	5.290E+01	7.429E+00	2.567E-01	1.072E+01	9.612E-02	3.816E-01	0.000E+00
10619790424	6298.00	2.140E+01	5.039E+00	5.402E+01	7.530E+00	2.582E-01	1.086E+01	9.783E-02	3.825E-01	0.000E+00
10619790501	24542.67	2.259E+01	5.190E+00	5.889E+01	7.974E+00	2.639E-01	1.143E+01	1.039E-01	3.844E-01	0.000E+00
10619790508	7578.79	2.293E+01	5.234E+00	6.031E+01	8.106E+00	2.653E-01	1.160E+01	1.057E-01	3.847E-01	0.000E+00
10619790516	6152.25	2.321E+01	5.267E+00	6.140E+01	8.207E+00	2.663E-01	1.172E+01	1.069E-01	3.847E-01	0.000E+00
10619790522	14335.30	2.384E+01	5.339E+00	6.377E+01	8.433E+00	2.679E-01	1.199E+01	1.091E-01	3.847E-01	0.000E+00
10619790529	16410.01	2.453E+01	5.415E+00	6.634E+01	8.680E+00	2.692E-01	1.228E+01	1.110E-01	3.847E-01	0.000E+00
10619790606	7915.52	2.489E+01	5.448E+00	6.750E+01	8.792E+00	2.695E-01	1.242E+01	1.116E-01	3.847E-01	0.000E+00
10619790612	665.26	2.492E+01	5.451E+00	6.759E+01	8.801E+00	2.695E-01	1.242E+01	1.116E-01	3.847E-01	0.000E+00
10619790619	211.12	2.493E+01	5.451E+00	6.762E+01	8.804E+00	2.695E-01	1.243E+01	1.116E-01	3.847E-01	0.000E+00
10619790626	0.00	2.493E+01	5.451E+00	6.762E+01	8.804E+00	2.695E-01	1.243E+01	1.116E-01	3.847E-01	0.000E+00
10619790703	0.00	2.493E+01	5.451E+00	6.762E+01	8.804E+00	2.695E-01	1.243E+01	1.116E-01	3.847E-01	0.000E+00
10619790710	0.00	2.493E+01	5.451E+00	6.762E+01	8.804E+00	2.695E-01	1.243E+01	1.116E-01	3.847E-01	0.000E+00
10619790717	3792.43	2.500E+01	5.459E+00	6.794E+01	8.843E+00	2.697E-01	1.246E+01	1.118E-01	3.847E-01	0.000E+00
10619790723	73236.81	2.804E+01	5.600E+00	7.346E+01	9.576E+00	2.725E-01	1.308E+01	1.146E-01	3.847E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10719760714	201789.63	1.553E-02	7.765E+00	1.708E+00	7.046E+07	8.455E+08	7.299E-01	7.765E-02	2.329E-02	4.271E+01	4.659E+00
10719760721	24429.25	1.647E-02	9.551E+00	2.197E+00	7.472E+07	1.153E+09	8.258E-01	7.765E-02	2.611E-02	4.759E+01	5.270E+00
10719760726	1258.25	1.647E-02	9.686E+00	2.237E+00	7.472E+07	1.179E+09	8.312E-01	7.813E-02	2.631E-02	4.783E+01	5.304E+00
10719760803	15.04	1.647E-02	9.607E+00	2.238E+00	7.473E+07	1.179E+09	8.312E-01	7.814E-02	2.631E-02	4.783E+01	5.304E+00
10719760810	2557.60	1.647E-02	9.716E+00	2.275E+00	7.629E+07	1.246E+09	8.423E-01	7.912E-02	2.739E-02	4.830E+01	5.373E+00
10719760817	9986.36	1.647E-02	1.010E+01	2.421E+00	7.926E+07	1.499E+09	9.022E-01	8.296E-02	2.970E-02	5.029E+01	5.688E+00
10719760824	. 75.58	1.647E-02	1.013E+01	2.422E+00	7.926E+07	1.501E+09	9.025E-01	8.299E-02	2.971E-02	5.031E+01	5.690E+00
10719760831	0.00	1.647E-02	1.013E+01	2.422E+00	7.926E+07	1.501E+09	9.025E-01	8.299E-02	2.971E-02	5.031E+01	5.690E+00
10719760907	0.00	1.647E-02	1.013E+01	2.422E+00	7.926E+07	1.501E+09	9.025E-01	8.299E-02	2.971E-02	5.031E+01	5.690E+00
10719760916	6.00	1.647E-02	1.013E+01	2.422E+00	7.926E+07	1.501E+09	9.025E-01	8.299E-02	2.971E-02	5.031E+01	5.690E+00
10719760922	0.00	1.647E-02	1.013E+01	2.422E+00	7.926E+07	1.501E+09	9.025E-01	8.299E-02	2.971E-02	5.031E+01	5.690E+00
10719760926	0.00	1.647E-02	1.013E+01	2.422E+00	7.926E+07	1.501E+09	9.025E-01	8.299E-02	2.971E-02	5.031E+01	5.690E+00
10719761005	21303.41	1.729E-02	1.021E+01	2.635E+00	8.074E+07	1.661E+09	9.689E-01	9.119E-02	3.053E-02	5.416E+01	6.149E+00
10719761012	6967.41	1.756E-02	1.032E+01	2.700E+00	8.099E+07	1.713E+09	1.040E+00	9.387E-02	3.160E-02	5.537E+01	6.340E+00
10719761019	0.00	1.756E-02	1.032E+01	2.700E+00	8.099E+07	1.713E+09	1.040E+00	9.387E-02	3.160E-02	5.537E+01	6.340E+00
10719761026	6100.66	1.779E-02	1.041E+01	2.754E+00	8.099E+07	1.757E+09	1.057E+00	9.622E-02	3.231E-02	5.649E+01	6.485E+00
10719761102	2811.23	1.833E-02	1.042E+01	2.780E+00	8.099E+07	1.768E+09	1.066E+00	9.730E-02	3.252E-02	5.688E+01	6.570E+00
10719761109	1373.81	1.839E-02	1.046E+01	2.794E+00	8.099E+07	1.769E+09	1.070E+00	9.783E-02	3.263E-02	5.705E+01	6.611E+00
10719761115	0.00	1.839E-02	1.046E+01	2.794E+00	8.099E+07	1.769E+09	1.070E+00	9.783E-02	3.263E-02	5.705E+01	6.611E+00
10719761122	22661.24	2.913E-02	1.080E+01	2.890E+00	8.099E+07	1.775E+09	1.190E+00	1.065E-01	3.350E-02	5.984E+01	7.317E+00
10719761130	10577.19	2.013E-02	1.105E+01	2.955E+00	8.099E+07	1.783E+09	1.235E+00	1.106E-01	3.432E-02	6.147E+01	7.679E+00
10719761207	13499.75	2.065E-02	1.126E+01	3.069E+00	8.122E+07	1.800E+09	1.286E+00	1.158E-01	3.587E-02	6.380E+01	8.147E+00
10719761214	32023.38	2.550E-02	1.130E+01	3.291E+00	8.170E+07	1.824E+09	1.383E+00	1.281E-01	3.834E-02	6.849E+01	9.256E+00
10719761220	79322.81	4.389E-02	1.168E+01	3.718E+00	8.455E+07	1.848E+09	1.920E+00	1.587E-01	4.444E-02	8.314E+01	1.206E+01
10719761229	60509.70	4.855E-02	1.238E+01	4.044E+00	8.561E+07	1.881E+09	2.155E+00	1.819E-01	4.910E-02	9.624E+01	1.411E+01
10719770108	33741.23	4.985E-02	1.316E+01	4.226E+00	8.561E+07	1.912E+09	2.187E+00	1.949E-01	5.040E-02	1.017E+02	1.527E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10719760714	201789.63	4.348E+00	7.765E-02	2.640E+00	1.864E+00	0.000E+00	5.435E-01	7.765E-03	7.765E-03	0.000E+00
10719760721	24429.25	4.884E+00	9.645E-02	2.941E+00	2.080E+00	0.000E+00	6.093E-01	8.705E-03	9.645E-03	0.000E+00
10719760726	1258.25	4.912E+00	9.790E-02	2.953E+00	2.090E+00	4.842E-05	6.127E-01	8.753E-03	9.790E-03	0.000E+00
10719760803	15.04	4.912E+00	9.793E-02	2.955E+00	2.090E+00	4.957E-05	6.128E-01	8.754E-03	9.793E-03	0.000E+00
10719760810	2557.60	4.967E+00	1.028E-01	2.982E+00	2.110E+00	1.480E-04	6.206E-01	8.833E-03	1.019E-02	0.000E+00
10719760817	9986.36	5.139E+00	1.221E-01	3.082E+00	2.183E+00	1.480E-04	6.514E-01	9.237E-03	1.134E-02	0.000E+00
10719760824	75.58	5.160E+00	1.222E-01	3.083E+00	2.184E+00	1.480E-04	6.516E-01	9.240E-03	1.135E-02	0.000E+00
10719760831	0.00	5.160E+00	1.222E-01	3.083E+00	2.184E+00	1.489E-04	6.516E-01	9.240E-03	1.135E-02	0.000E+00
10719760907	0.00	5.160E+00	1.222E-01	3.083E+00	2.184E+00	1.489E-04	6.516E-01	9.240E-03	1.135E-02	0.000E+00
10719760916	0.00	5.160E+00	1.222E-01	3.083E+00	2.184E+00	1.489E-04	6.516E-01	9.240E-03	1.135E-02	0.000E+00
10719760922	0.00	5.160E+00	1.222E-01	3.083E+00	2.184E+00	1.480E-04	6.516E-01	9.240E-03	1.135E-02	0.000E+00
10719760928	0.00	5.160E+00	1.222E-01	3.083E+00	2.184E+00	1.480E-04	6.516E-01	9.240E-03	1.135E-02	0.000E+00
10719761005	21303.41	5.447E+00	1.632E-01	3.386E+00	2.380E+00	1.489E-04	7.008E-01	1.170E-02	1.298E-02	0.000E+00
10719761012	6967.41	5.546E+00	1.712E-01	3.485E+00	2.445E+00	1.489E-04	7.142E-01	1.250E-02	1.325E-02	0.000E+00
10719761019	0.00	5.546E+00	1.712E-01	3.485E+00	2.445E+00	1.489E-04	7.142E-01	1.250E-02	1.325E-02	0.000E+00
10719761026	6100.66	5.642E+00	1.712E-01	3.574E+00	2.503E+00	1.480E-04	7.259E-01	1.368E-02	1.349E-02	0.000E+00
10719761102	2811.23	5.691E+00	1.712E-01	3.617E+00	2.533E+00	1.480E-04	7.324E-01	1.443E-02	1.360E-02	0.000E+00
10719761109	1373.81	5.715E+00	1.712E-01	3.637E+00	2.547E+00	1.480E-04	7.356E-01	1.470E-02	1.365E-02	0.000E+00
10719761115	0.00	5.715E+00	1.712E-01	3.637E+00	2.547E+00	1.480E-04	7.356E-01	1.470E-02	1.365E-02	0.000E+00
10719761122	22661.24	6.107E+00	1.712E-01	3.995E+00	2.782E+00	1.480E-04	7.879E-01	1.644E-02	1.452E-02	0.000E+00
10719761130	10577.19	6.290E+00	1.712E-01	4.166E+00	2.896E+00	1.480E-04	8.123E-01	1.685E-02	1.493E-02	0.000E+00
10719761207	13499.75	6.524E+00	1.712E-01	4.394E+00	3.052E+00	1.480E-04	8.539E-01	1.685E-02	1.545E-02	0.000E+00
10719761214	32023.38	7.091E+00	1.712E-01	4.924E+00	3.422E+00	1.480E-04	9.401E-01	1.685E-02	1.545E-02	0.000E+00
10719761220	79322.81	8.526E+00	1.712E-01	6.206E+00	4.338E+00	1.480E-04	1.123E+00	1.685E-02	1.545E-02	0.000E+00
10719761229	60509.70	9.643E+00	1.712E-01	[illegible]	5.036E+00	1.480E-04	1.240E+00	1.683E-02	1.545E-02	0.000E+00
10719770105	33741.23	1:029E+01	1.712E-01	7.693E+00	5.439E+00	1.480E-04	1.305E+00	1.815E-02	1.543E-02	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10719770113	65141.45	0.000E+00	1.504E+00	3.008E-01	0.000E+00	5.118E+07	5.514E-02	2.507E-02	2.507E-02	1.379E+01	2.456E+00
10719770119	57210.15	2.201E-03	2.384E+00	5.209E-01	0.000E+00	8.614E+07	2.709E-01	4.708E-02	3.167E-02	2.215E+01	4.658E+00
10719770127	33169.92	6.030E-03	3.278E+00	6.358E-01	0.000E+00	1.024E+08	3.704E-01	5.984E-02	3.295E-02	2.751E+01	6.011E+00
10719770131	9891.18	6.030E-03	3.697E+00	6.662E-01	0.000E+00	1.058E+08	4.001E-01	6.365E-02	3.371E-02	2.915E+01	6.414E+00
10719770207	11258.44	6.464E-03	4.000E+00	7.139E-01	0.000E+00	1.412E+08	4.400E-01	6.798E-02	3.457E-02	3.097E+01	6.891E+00
10719770216	11475.44	6.905E-03	4.088E+00	7.978E-01	0.000E+00	1.592E+08	4.612E-01	7.240E-02	4.252E-02	3.278E+01	7.284E+00
10719770224	5609.97	1.014E-02	4.671E+00	8.323E-01	1.959E+05	1.726E+08	4.810E-01	7.456E-02	4.360E-02	3.360E+01	7.476E+00
10719770302	27423.21	1.120E-02	8.048E+00	9.801E-01	2.111E+06	2.588E+08	6.077E-01	8.511E-02	4.677E-02	3.824E+01	8.436E+00
10719770310	56305.60	1.333E-02	8.260E+00	1.512E+00	5.973E+06	4.403E+08	7.566E-01	1.064E-01	5.741E-02	4.675E+01	1.033E+01
10719770317	77968.63	1.933E-02	8.561E+00	2.772E+00	1.142E+07	7.126E+08	1.069E+00	1.364E-01	9.041E-02	6.055E+01	1.309E+01
10719770323	38706.59	1.933E-02	9.156E+00	3.457E+00	1.277E+07	8.234E+08	1.182E+00	1.513E-01	1.559E-01	6.592E+01	1.449E+01
10719770401	36517.68	4.462E-02	1.028E+01	4.146E+00	1.341E+07	9.088E+08	1.438E+00	1.653E-01	1.658E-01	7.041E+01	1.611E+01
10719770406	7972.69	4.707E-02	1.068E+01	4.315E+00	1.341E+07	9.212E+08	1.468E+00	1.684E-01	1.667E-01	7.127E+01	1.639E+01
10719770414	2587.52	4.767E-02	1.080E+01	4.365E+00	1.341E+07	9.249E+08	1.493E+00	1.694E-01	1.669E-01	7.181E+01	1.649E+01
10719770420	0.00	4.767E-02	1.080E+01	4.365E+00	1.341E+07	9.249E+08	1.493E+00	1.694E-01	1.669E-01	7.181E+01	1.649E+01
10719770427	0.00	4.767E-02	1.080E+01	4.365E+00	1.341E+07	9.249E+08	1.493E+00	1.694E-01	1.669E-01	7.181E+01	1.649E+01
10719770504	0.00	4.767E-02	1.080E+01	4.365E+00	1.341E+07	9.249E+08	1.493E+00	1.694E-01	1.669E-01	7.181E+01	1.649E+01
10719770511	14857.38	4.881E-02	1.120E+01	4.537E+00	1.341E+07	9.371E+08	1.591E+00	1.694E-01	1.686E-01	7.490E+01	1.704E+01
10719770519	4484.29	4.916E-02	1.132E+01	4.580E+00	1.341E+07	9.402E+08	1.617E+00	1.711E-01	1.690E-01	7.583E+01	1.721E+01
10719770526	9239.98	4.916E-02	1.157E+01	4.648E+00	1.341E+07	9.449E+08	1.670E+00	1.747E-01	1.704E-01	7.791E+01	1.747E+01
10719770601	17541.74	4.916E-02	1.191E+01	4.749E+00	1.341E+07	9.516E+08	1.727E+00	1.814E-01	1.717E-01	8.196E+01	1.804E+01
10719770607	2108.92	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770614	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770621	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770629	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770706	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770713	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770721	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770726	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770802	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770810	0.00	4.916E-02	1.195E+01	4.760E+00	1.348E+07	9.533E+08	1.738E+00	1.822E-01	1.721E-01	8.249E+01	1.811E+01
10719770817	285.48	4.943E-02	1.195E+01	4.761E+00	1.363E+07	9.548E+08	1.740E+00	1.832E-01	1.721E-01	8.253E+01	1.812E+01
10719770822	7695.27	4.943E-02	1.210E+01	4.775E+00	1.806E+07	1.001E+09	1.769E+00	1.862E-01	1.736E-01	8.342E+01	1.831E+01
10719770830	0.00	4.943E-02	1.210E+01	4.775E+00	1.806E+07	1.001E+09	1.769E+00	1.862E-01	1.736E-01	8.342E+01	1.831E+01
10719770906	9087.83	4.943E-02	1.227E+01	4.793E+00	2.425E+07	1.063E+09	1.810E+00	1.862E-01	1.743E-01	8.471E+01	1.857E+01
10719770913	108743.25	5.362E-02	1.437E+01	5.044E+00	1.078E+08	1.860E+09	2.337E+00	2.280E-01	1.785E-01	1.023E+02	2.204E+01
10719770920	26196.08	6.269E-02	1.477E+01	5.094E+00	1.243E+08	2.029E+09	2.464E+00	2.381E-01	1.815E-01	1.069E+02	2.289E+01
10719770927	0.00	6.269E-02	1.477E+01	5.094E+00	1.243E+08	2.029E+09	2.464E+00	2.381E-01	1.815E-01	1.069E+02	2.289E+01
10719771004	0.00	6.269E-02	1.477E+01	5.094E+00	1.243E+08	2.029E+09	2.464E+00	2.381E-01	1.815E-01	1.069E+02	2.289E+01
10719771011	0.00	6.269E-02	1.477E+01	5.094E+00	1.243E+08	2.029E+09	2.464E+00	2.381E-01	1.815E-01	1.069E+02	2.289E+01
10719771018	18538.54	6.554E-02	1.484E+01	5.130E+00	1.255E+08	2.084E+09	2.516E+00	2.452E-01	1.815E-01	1.094E+02	2.345E+01
10719771025	5349.82	6.760E-02	1.515E+01	5.153E+00	1.259E+08	2.093E+09	2.529E+00	2.473E-01	1.817E-01	1.102E+02	2.367E+01
10719771103	141755.25	1.003E-01	3.097E+01	6.189E+00	1.383E+08	2.125E+09	3.047E+00	3.019E-01	1.926E-01	1.325E+02	2.825E+01
10719771108	192008.94	1.151E-01	3.614E+01	6.854E+00	1.504E+08	2.145E+09	3.919E+00	3.757E-01	2.517E-01	1.680E+02	3.335E+01
10719771115	167411.06	2.117E-01	6.835E+01	7.112E+00	1.818E+08	2.154E+09	4.512E+00	4.402E-01	2.968E-01	1.925E+02	3.889E+01
10719771122	17097.39	2.203E-01	7.059E+01	7.171E+00	1.830E+08	2.160E+09	4.724E+00	4.467E-01	2.988E-01	1.949E+02	3.945E+01
10719771129	7928.54	2.233E-01	7.068E+01	7.217E+00	1.830E+08	2.166E+09	4.747E+00	4.498E-01	2.994E-01	1.961E+02	3.971E+01
10719771206	6351.66	2.253E-01	7.102E+01	7.251E+00	1.830E+08	2.172E+09	4.767E+00	4.522E-01	2.996E-01	1.970E+02	3.992E+01
10719771212	12917.45	2.323E-01	7.152E+01	7.316E+00	1.832E+08	2.190E+09	4.883E+00	4.572E-01	3.001E-01	1.998E+02	4.055E+01
10719771220	13019.64	2.383E-01	7.292E+01	7.381E+00	1.832E+08	2.210E+09	4.925E+00	4.622E-01	3.011E-01	2.021E+02	4.099E+01
10719771230	71174.88	2.656E-01	7.675E+01	7.764E+00	1.832E+08	2.331E+09	5.138E+00	4.896E-01	3.066E-01	2.142E+02	4.332E+01
10719780105	74378.94	3.114E-01	7.847E+01	8.251E+00	1.832E+08	2.474E+09	5.339E+00	5.182E-01	3.095E-01	2.270E+02	4.567E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
10719770113	65141.45	1.278E+00	1.003E-01	1.003E+00	6.768E-01	0.000E+00	1.233E-01	5.013E-03	0.000E+00	0.000E+00
10719770119	57210.15	2.423E+00	2.984E-01	1.883E+00	1.183E+00	0.000E+00	2.354E-01	1.162E-02	0.000E+00	0.000E+00
10719770127	33169.92	3.100E+00	4.643E-01	2.394E+00	1.438E+00	0.000E+00	2.992E-01	1.545E-02	0.000E+00	0.000E+00
10719770131	9891.18	3.305E+00	5.366E-01	2.546E+00	1.499E+00	0.000E+00	3.182E-01	1.735E-02	0.000E+00	0.000E+00
10719770207	11258.44	3.543E+00	6.363E-01	2.724E+00	1.564E+00	0.000E+00	3.399E-01	1.995E-02	4.332E-04	0.000E+00
10719770216	11475.44	3.786E+00	7.069E-01	2.896E+00	1.626E+00	0.000E+00	3.620E-01	2.171E-02	8.748E-04	0.000E+00
10719770224	5609.97	3.905E+00	7.242E-01	2.976E+00	1.656E+00	0.000E+00	3.728E-01	2.193E-02	1.091E-03	0.000E+00
10719770302	27423.21	4.496E+00	7.453E-01	3.356E+00	1.804E+00	0.000E+00	4.255E-01	2.193E-02	3.201E-03	0.000E+00
10719770310	55305.60	5.688E+00	7.879E-01	4.100E+00	2.102E+00	0.000E+00	5.319E-01	2.193E-02	5.329E-03	0.000E+00
10719770317	77968.63	7.398E+00	8.479E-01	5.120E+00	2.522E+00	0.000E+00	6.820E-01	2.193E-02	5.329E-03	0.000E+00
10719770323	38706.59	8.261E+00	8.776E-01	5.612E+00	2.730E+00	0.000E+00	7.564E-01	2.193E-02	5.329E-03	0.000E+00
10719770401	36517.68	9.091E+00	9.057E-01	6.062E+00	2.927E+00	0.000E+00	8.267E-01	2.193E-02	5.329E-03	0.000E+00
10719770406	7972.69	9.275E+00	9.149E-01	6.157E+00	2.970E+00	0.000E+00	8.420E-01	2.193E-02	5.329E-03	0.000E+00
10719770414	2587.52	9.334E+00	9.179E-01	6.187E+00	2.984E+00	0.000E+00	8.470E-01	2.193E-02	5.329E-03	0.000E+00
10719770420	0.00	9.334E+00	9.179E-01	6.187E+00	2.984E+00	0.000E+00	8.470E-01	2.193E-02	5.329E-03	0.000E+00
10719770427	0.00	9.334E+00	9.179E-01	6.187E+00	2.984E+00	0.000E+00	8.470E-01	2.193E-02	5.329E-03	0.000E+00
10719770504	0.00	9.334E+00	9.179E-01	6.187E+00	2.984E+00	0.000E+00	8.470E-01	2.193E-02	5.329E-08	0.000E+00
10719770511	14057.38	9.700E+00	9.580E-01	6.358E+00	3.064E+00	0.000E+00	8.756E-01	2.193E-02	5.329E-03	0.000E+00
10719770519	4484.29	9.814E+00	9.718E-01	6.410E+00	3.088E+00	0.000E+00	8.842E-01	2.193E-02	5.329E-03	0.000E+00
10719770526	9239.98	1.006E+01	1.007E+09	6.516E+00	3.138E+00	0.000E+00	9.055E-01	2.193E-02	5.329E-03	0.000E+00
10719770601	17541.74	1.054E+01	1.088E+00	6.726E+00	3.239E+00	0.000E+00	9.528E-01	2.193E-02	5.329E-03	0.000E+00
10719770607	2108.92	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770614	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770621	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770629	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770706	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770713	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770721	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770726	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770802	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770810	0.00	1.059E+01	1.098E+00	6.751E+00	3.251E+00	0.000E+00	9.577E-01	2.193E-02	5.329E-03	0.000E+00
10719770817	203.40	1.060E+01	1.099E+00	6.755E+00	3.253E+00	0.000E+00	9.580E-01	2.193E-02	5.329E-03	0.000E+00
10719770822	7695.27	1.076E+01	1.135E+00	6.877E+00	3.310E+00	0.000E+00	9.669E-01	2.193E-02	5.329E-03	0.000E+00
10719770830	0.00	1.076E+01	1.135E+00	6.877E+00	3.310E+00	0.000E+00	9.669E-01	2.193E-02	5.329E-03	0.000E+00
10719770906	9087.83	1.096E+01	1.180E+00	7.031E+00	3.383E+00	3.497E-04	9.774E-01	2.228E-02	5.679E-03	0.000E+00
10719770913	108743.25	1.326E+01	1.766E+00	8.997E+00	4.346E+00	8.718E-03	1.103E+00	3.065E-02	1.405E-02	0.000E+00
10719770920	26196.08	1.380E+01	1.877E+00	9.461E+00	4.547E+00	9.726E-03	1.123E+00	3.166E-02	1.606E-02	0.000E+00
10719770927	0.00	1.380E+01	1.877E+00	9.461E+00	4.547E+00	9.726E-03	1.123E+00	3.166E-02	1.606E-02	0.000E+00
10719771004	0.00	1.380E+01	1.877E+00	9.461E+00	4.547E+00	9.726E-03	1.123E+00	3.166E-02	1.606E-02	0.000E+00
10719771011	0.00	1.380E+01	1.877E+00	9.461E+00	4.547E+00	9.726E-03	1.123E+00	3.166E-02	1.606E-02	0.000E+00
10719771018	18538.54	1.417E+01	1.898E+00	9.760E+00	4.633E+00	1.044E-02	1.130E+00	3.237E-02	1.749E-02	0.000E+00
10719771025	5349.82	1.427E+01	1.901E+00	9.845E+00	4.653E+00	1.065E-02	1.132E+00	3.258E-02	1.790E-02	0.000E+00
10719771103	141755.25	1.711E+01	1.901E+00	1.214E+01	5.144E+00	1.610E-02	1.241E+00	3.803E-02	3.972E-02	0.000E+00
10719771108	192008.94	2.331E+01	1.901E+00	1.790E+01	6.252E+00	2.349E-02	3.901E+00	4.542E-02	7.666E-02	0.000E+00
10719771115	167411.06	2.988E+01	1.901E+00	2.421E+01	7.412E+00	2.993E-02	7.380E+00	5.186E-02	1.153E-01	0.000E+00
10719771122	17097.39	3.072E+01	1.901E+00	2.504E+01	7.570E+00	3.059E-02	7.906E+00	5.252E-02	1.199E-01	0.000E+00
10719771129	7928.54	3.119E+01	1.907E+00	2.531E+01	7.661E+00	3.150E-02	8.235E+00	5.343E-02	1.230E-01	0.000E+00
10719771206	6351.66	3.132E+01	1.907E+00	2.564E+01	7.681E+00	3.150E-02	8.240E+00	5.392E-02	1.235E-01	0.000E+00
10719771212	12917.45	3.158E+01	1.917E+00	2.588E+01	7.731E+00	3.150E-02	8.250E+00	5.442E-02	1.240E-01	0.000E+00
10719771220	13019.64	3.184E+01	1.937E+00	2.613E+01	7.791E+00	3.150E-02	8.265E+00	5.492E-02	1.240E-01	0.000E+00
10719771230	71174.88	3.330E+01	2.128E+00	2.750E+01	8.202E+00	3.150E-02	8.373E+00	5.766E-02	1.240E-01	0.000E+00
10719780105	74378.94	3.484E+01	2.472E+00	2.896E+01	8.774E+00	3.437E-02	8.547E+00	6.338E-02	1.240E-01	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	F	TOC	CL
10719780110	40301.18	0.000E+00	3.101E-01	3.257E-01	0.000E+00	5.720E+08	2.125E-01	1.551E-02	6.203E-03	6.823E+00	1.303E+00
10719780117	111469.81	8.570E-03	2.026E+00	1.398E+00	0.000E+00	3.297E+09	6.320E-01	5.840E-02	1.478E-02	2.913E+01	5.463E+00
10719780124	183101.31	2.267E-02	2.730E+00	3.300E+00	0.000E+00	5.806E+09	1.563E+00	1.289E-01	2.887E-02	5.449E+01	1.060E+01
10719780131	178781.00	2.955E-02	5.402E+00	5.364E+00	0.000E+00	6.337E+09	2.099E+00	1.976E-01	4.263E-02	8.614E+01	1.611E+01
10719780207	61863.01	2.955E-02	6.672E+00	5.816E+00	2.160E+06	6.547E+09	2.492E+00	2.215E-01	4.501E-02	1.035E+02	1.990E+01
10719780216	27732.89	3.915E-02	8.700E+00	5.902E+00	4.097E+06	6.654E+09	2.522E+00	2.321E-01	4.715E-02	1.048E+02	2.009E+01
10719780224	40971.42	4.388E-02	2.494E+01	6.059E+00	4.812E+06	6.773E+09	2.699E+00	2.479E-01	5.661E-02	1.089E+02	2.122E+01
10719780228	23049.95	4.832E-02	2.565E+01	6.175E+00	4.812E+06	6.822E+09	2.766E+00	2.568E-01	6.015E-02	1.112E+02	2.184E+01
10719780308	109716.50	7.365E-02	3.282E+01	6.597E+00	3.163E+07	7.038E+09	3.247E+00	8.478E-01	1.235E-01	1.239E+02	2.551E+01
10719780314	95303.06	2.057E-01	3.356E+01	6.817E+00	1.032E+08	7.204E+09	3.944E+00	1.178E+00	1.602E-01	1.385E+02	2.903E+01
10719780321	49683.46	2.057E-01	3.719E+01	7.100E+00	1.249E+08	7.268E+09	4.089E+00	1.197E+00	1.602E-01	1.466E+02	3.018E+01
10719780329	40811.26	2.104E-01	3.782E+01	7.745E+00	1.277E+08	7.298E+09	4.187E+00	1.213E+00	1.633E-01	1.528E+02	3.118E+01
10719780405	33075.16	2.129E-01	3.795E+01	8.165E+00	1.329E+08	7.362E+09	4.290E+00	1.225E+00	1.633E-01	1.574E+02	3.197E+01
10719780412	12874.62	2.129E-01	3.819E+01	8.314E+00	1.361E+08	7.400E+09	4.318E+00	1.225E+00	1.638E-01	1.591E+02	3.227E+01
10719780419	6994.84	2.129E-01	3.844E+01	8.392E+00	1.385E+08	7.428E+09	4.327E+00	1.228E+00	1.643E-01	1.600E+02	3.244E+01
10719780425	41486.13	2.129E-01	4.019E+01	8.839E+00	1.465E+08	7.528E+09	4.426E+00	1.244E+00	1.659E-01	1.654E+02	3.368E+01
10719780427	65927.69	2.231E-01	4.374E+01	9.524E+00	1.499E+08	7.596E+09	4.446E+00	1.269E+00	1.710E-01	1.741E+02	3.485E+01
10719780502	73387.00	2.231E-01	4.459E+01	1.029E+01	1.512E+08	7.638E+09	4.644E+00	1.298E+00	1.766E-01	1.842E+02	3.649E+01
10719780510	105975.13	2.598E-01	4.541E+01	1.135E+01	1.512E+08	7.692E+09	5.032E+00	1.338E+00	1.848E-01	1.981E+02	3.890E+01
10719780516	89087.38	3.146E-01	5.089E+01	1.227E+01	1.512E+08	7.729E+09	5.261E+00	1.373E+00	1.882E-01	2.111E+02	4.187E+01
10719780522	23364.91	3.370E-01	6.093E+01	1.251E+01	1.512E+08	7.780E+09	5.317E+00	1.382E+00	1.891E-01	2.144E+02	4.202E+01
10719780529	339.21	3.370E-01	6.102E+01	1.251E+01	1.512E+08	7.781E+09	5.318E+00	1.382E+00	1.891E-01	2.145E+02	4.203E+01
10719780606	26798.36	3.453E-01	6.288E+01	1.277E+01	1.512E+08	7.942E+09	5.396E+00	1.392E+00	1.902E-01	2.191E+02	4.252E+01
10719780614	6165.58	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780620	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780628	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780705	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780712	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780718	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780725	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780801	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780808	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780814	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780823	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780829	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780905	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780912	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780919	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719780926	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781003	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781010	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781017	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781025	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781031	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781109	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781114	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781121	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781128	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781205	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781213	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781219	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719781228	0.00	3.477E-01	6.293E+01	1.283E+01	1.513E+08	7.994E+09	5.419E+00	1.395E+00	1.904E-01	2.203E+02	4.267E+01
10719790104	13068.93	3.477E-01	6.353E+01	1.293E+01	1.730E+08	8.066E+09	5.467E+00	1.400E+00	1.904E-01	2.203E+02	4.813E+01

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MG	CU	FE	MN	ZN	CD
107197800110	40301.18	9.770E-01	1.396E-01	8.839E-01	3.412E-01	1.551E-03	7.754E-02	1.551E-03	0.000E+00	0.000E+00
107197800117	111469.81	3.979E+00	4.398E-01	3.543E+00	1.328E+00	5.840E-03	2.920E-01	5.840E-03	0.000E+00	0.000E+00
107197800124	183101.31	9.686E+00	7.216E-01	8.405E+00	3.089E+00	1.289E-02	6.443E-01	1.289E-02	0.000E+00	0.000E+00
107197800131	178781.00	1.692E+01	7.904E-01	1.370E+01	5.015E+00	1.976E-02	9.882E-01	1.976E-02	0.000E+00	0.000E+00
107197800207	61863.01	1.849E+01	7.904E-01	1.575E+01	5.777E+00	2.453E-02	1.131E+00	2.453E-02	2.300E-03	0.000E+00
107197800216	27732.89	1.943E+01	8.438E-01	1.656E+01	6.076E+00	2.666E-02	1.184E+00	2.666E-02	3.448E-03	0.000E+00
107197800224	40971.42	2.050E+01	1.017E+00	1.757E+01	6.430E+00	2.981E-02	1.263E+00	2.981E-02	6.601E-03	0.000E+00
107197800228	23049.95	2.095E+01	1.159E+00	1.804E+01	6.607E+00	3.247E-02	1.308E+00	3.159E-02	9.261E-03	0.000E+00
107197800308	109716.50	2.272E+01	2.003E+00	2.007E+01	7.367E+00	4.936E-02	1.519E+00	4.425E-02	2.618E-02	0.000E+00
107197800314	95303.06	2.433E+01	2.517E+00	2.175E+01	8.027E+00	5.670E-02	1.665E+00	5.159E-02	3.715E-02	0.000E+00
107197800321	49683.46	2.519E+01	2.659E+00	2.261E+01	8.371E+00	5.861E-02	1.742E+00	5.350E-02	4.097E-02	0.000E+00
107197800329	40811.26	2.593E+01	2.752E+00	2.330E+01	8.654E+00	5.861E-02	1.805E+00	5.507E-02	4.411E-02	0.000E+00
107197800405	33075.16	2.657E+01	2.753E+00	2.386E+01	8.908E+00	5.861E-02	1.856E+00	5.634E-02	4.793E-02	0.000E+00
107197800412	12074.62	2.681E+01	2.752E+00	2.408E+01	9.002E+00	5.861E-02	1.875E+00	5.684E-02	4.892E-02	0.000E+00
107197800419	6994.84	2.695E+01	2.752E+00	2.420E+01	9.054E+00	5.861E-02	1.886E+00	5.711E-02	4.919E-02	0.000E+00
107197800425	41486.13	2.775E+01	2.752E+00	2.490E+01	9.357E+00	5.861E-02	1.930E+00	5.870E-02	5.079E-02	0.000E+00
107197800427	65927.69	2.902E+01	2.752E+00	2.602E+01	9.839E+00	5.861E-02	2.051E+00	6.124E-02	5.333E-02	0.000E+00
107197800502	73387.00	3.043E+01	2.752E+00	2.726E+01	1.030E+01	5.861E-02	2.164E+00	6.496E-02	5.615E-02	0.000E+00
107197800510	105978.13	3.243E+01	2.752E+00	2.897E+01	1.111E+01	5.861E-02	2.320E+00	6.814E-02	6.025E-02	0.000E+00
107197800516	69087.38	3.404E+01	2.752E+00	3.031E+01	1.169E+01	5.861E-02	2.465E+00	7.157E-02	6.366E-02	0.000E+00
107197800522	23304.91	3.445E+01	2.752E+00	3.064E+01	1.184E+01	5.861E-02	2.591E+00	7.247E-02	6.455E-02	0.000E+00
107197800529	339.21	3.446E+01	2.752E+00	3.065E+01	1.184E+01	5.861E-02	2.591E+00	7.248E-02	6.456E-02	0.000E+00
107197800606	26790.36	3.492E+01	2.752E+00	3.100E+01	1.199E+01	5.861E-02	2.573E+00	7.351E-02	6.663E-02	0.000E+00
107197800614	6165.58	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800620	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800628	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800705	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800712	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800718	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800725	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800801	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800808	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800814	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800823	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800829	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800905	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800912	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800919	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197800926	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801003	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801010	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801017	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801025	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801031	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801109	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801114	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801121	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801128	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801205	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801213	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801219	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197801228	0.00	3.503E+01	2.752E+00	3.108E+01	1.203E+01	5.861E-02	2.588E+00	7.375E-02	6.710E-02	0.000E+00
107197900104	13068.93	3.532E+01	2.857E+00	3.134E+01	1.213E+01	5.911E-02	2.608E+00	7.526E-02	7.464E-02	0.000E+00

Appendix E (Cont'd)

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NO3-N	F.S	BOD	COL-F	COL-T	TKN	NH4-N	P	TOC	CL
10719790116	87375.13	1.009E-02	4.035E+00	4.707E-01	8.848E+07	2.868E+08	4.303E-01	3.362E-02	6.724E-03	0.000E+00	3.093E+00
10719790123	93995.69	1.009E-02	4.396E+00	6.877E-01	8.848E+07	3.081E+08	1.038E+00	1.421E-01	1.396E-02	0.000E+00	6.710E+00
10719790130	51437.66	1.009E-02	5.188E+00	7.867E-01	8.848E+07	3.315E+08	1.220E+00	1.619E-01	1.594E-02	0.000E+00	8.610E+00
10719790206	16930.42	1.009E-02	6.100E+00	8.192E-01	8.848E+07	3.430E+08	1.298E+00	1.684E-01	4.134E-02	0.000E+00	9.301E+00
10719790213	28315.89	1.662E-02	9.478E+00	8.955E-01	9.144E+07	3.613E+08	1.414E+00	1.793E-01	4.243E-02	0.000E+00	1.037E+01
10719790222	47330.81	2.209E-02	1.421E+01	1.059E+00	1.014E+08	3.902E+08	1.652E+00	1.975E-01	4.426E-02	0.000E+00	1.164E+01
10719790227	71932.19	2.486E-02	1.698E+01	1.419E+00	1.277E+08	4.317E+08	1.901E+00	2.252E-01	4.979E-02	0.000E+00	1.402E+01
10719790307	98029.13	2.486E-02	1.736E+01	2.174E+00	1.483E+08	4.659E+08	2.230E+00	2.629E-01	5.356E-02	0.000E+00	1.723E+01
10719790313	71649.63	2.486E-02	3.611E+01	3.083E+00	1.483E+08	4.659E+08	2.453E+00	2.905E-01	5.908E-02	0.000E+00	1.979E+01
10719790320	26854.69	2.486E-02	3.714E+01	3.383E+00	1.516E+08	4.776E+08	2.511E+00	3.008E-01	5.908E-02	0.000E+00	2.070E+01
10719790327	12895.88	2.734E-02	3.778E+01	3.512E+00	1.552E+08	4.902E+08	2.549E+00	3.058E-01	5.908E-02	0.000E+00	2.113E+01
10719790405	4823.11	2.826E-02	3.867E+01	3.555E+00	1.559E+08	4.943E+08	2.561E+00	3.077E-01	5.908E-02	0.000E+00	2.130E+01
10719790411	7683.69	2.826E-02	3.909E+01	3.614E+00	1.560E+08	4.995E+08	2.583E+00	3.106E-01	5.967E-02	0.000E+00	2.152E+01
10719790417	55116.30	2.826E-02	4.757E+01	4.017E+00	1.609E+08	5.428E+08	2.851E+00	3.742E-01	6.391E-02	0.000E+00	2.314E+01
10719790424	15822.64	2.826E-02	4.946E+01	4.127E+00	1.633E+08	5.569E+08	2.921E+00	3.925E-01	6.452E-02	0.000E+00	2.359E+01
10719790501	28874.47	3.049E-02	5.190E+01	4.315E+00	1.699E+08	5.861E+08	3.033E+00	4.036E-01	6.674E-02	0.000E+00	2.441E+01
10719790509	4954.68	3.049E-02	5.221E+01	4.346E+00	1.715E+08	5.917E+08	3.047E+00	4.055E-01	6.693E-02	0.000E+00	2.455E+01
10719790516	30429.65	3.517E-02	5.338E+01	4.533E+00	1.837E+08	6.311E+08	3.195E+00	4.289E-01	6.927E-02	0.000E+00	2.541E+01
10719790522	60488.99	3.517E-02	5.478E+01	4.929E+00	2.143E+08	7.187E+08	3.397E+00	4.522E-01	7.160E-02	0.000E+00	2.718E+01
10719790529	35018.37	3.652E-02	5.518E+01	4.929E+00	2.143E+08	7.187E+08	3.520E+00	4.657E-01	7.430E-02	0.000E+00	2.816E+01

CUMULATIVE NUTRIENT MASS TABLE

ST. DATE	FLOW VOLUME	NA	K	CA	MC	CU	FE	MN	ZN	CD
10719790116	87375.13	2.085E+00	6.052E-01	1.883E+00	6.724E-01	1.345E-02	1.345E-01	6.724E-03	3.362E-02	0.000E+00
10719790123	93995.69	4.399E+00	1.184E+00	3.981E+00	1.396E+00	3.153E-02	2.792E-01	1.034E-02	5.694E-02	0.000E+00
10719790130	51437.66	5.725E+00	1.461E+00	5.168E+00	1.792E+00	4.539E-02	3.583E-01	1.232E-02	6.884E-02	0.000E+00
10719790206	16930.42	6.188E+00	1.546E+00	5.585E+00	1.928E+00	5.190E-02	3.844E-01	1.362E-02	7.144E-02	0.000E+00
10719790213	28315.89	6.907E+00	1.687E+00	6.228E+00	2.135E+00	5.953E-02	4.280E-01	1.471E-02	7.471E-02	0.000E+00
10719790222	47330.81	8.036E+00	1.924E+00	7.211E+00	2.445E+00	6.681E-02	5.008E-01	1.653E-02	7.653E-02	0.000E+00
10719790227	71932.19	9.614E+00	2.312E+00	8.540E+00	2.860E+00	6.958E-02	6.115E-01	1.930E-02	7.653E-02	0.000E+00
10719790307	98029.13	1.169E+01	2.877E+00	1.028E+01	3.426E+00	6.958E-02	7.624E-01	2.307E-02	7.653E-02	0.000E+00
10719790313	71649.63	1.320E+01	3.153E+00	1.149E+01	3.812E+00	6.958E-02	8.562E-01	2.307E-02	7.653E-02	0.000E+00
10719790320	26854.69	1.377E+01	3.225E+00	1.192E+01	3.946E+00	6.958E-02	8.861E-01	2.307E-02	7.653E-02	0.000E+00
10719790327	12895.88	1.405E+01	3.240E+00	1.212E+01	4.006E+00	6.958E-02	8.980E-01	2.307E-02	7.653E-02	0.000E+00
10719790405	4823.11	1.415E+01	3.240E+00	1.219E+01	4.028E+00	6.958E-02	9.017E-01	2.307E-02	7.653E-02	0.000E+00
10719790411	7683.69	1.431E+01	3.252E+00	1.232E+01	4.061E+00	6.988E-02	9.094E-01	2.307E-02	7.653E-02	0.000E+00
10719790417	55116.30	1.548E+01	3.379E+00	1.332E+01	4.294E+00	7.412E-02	9.731E-01	2.307E-02	7.653E-02	0.000E+00
10719790424	15822.64	1.582E+01	3.434E+00	1.363E+01	4.361E+00	7.595E-02	9.938E-01	2.368E-02	7.653E-02	0.000E+00
10719790501	28874.47	1.646E+01	3.579E+00	1.424E+01	4.494E+00	8.150E-02	1.038E+00	2.702E-02	7.653E-02	0.000E+00
10719790509	4954.68	1.646E+01	3.579E+00	1.424E+01	4.494E+00	8.150E-02	1.038E+00	2.702E-02	7.653E-02	0.000E+00
10719790516	30429.65	1.646E+01	3.579E+00	1.424E+01	4.494E+00	8.150E-02	1.038E+00	2.702E-02	7.653E-02	0.000E+00
10719790522	60488.99	1.646E+01	3.579E+00	1.424E+01	4.494E+00	8.150E-02	1.038E+00	2.702E-02	7.653E-02	0.000E+00
10719790529	35018.37	1.646E+01	3.579E+00	1.424E+01	4.494E+00	8.150E-02	1.038E+00	2.702E-02	7.653E-02	0.000E+00

Appendix Table F. A comparison of the total phosphorus and dissolved orthophosphate-phosphorus in drainage waters from the two developed organic soil sites.

	Site 103 Deep Organic			Site 106 Shallow Organic		
Obs.	Date	Total P	Ortho-P	Date	Total P	Ortho-P
	----------------------------	----------------------------	----------- mg/l	----------------------------	----------------------------	----------------------------
	1976			1976		
1	4-28	.55	.24	5-3	.22	.04
2	5-3	.26	.20	8-3	1.05	.48
3	5-11	.31	.28	8-10	.28	.22
4	5-18	.54	.43	8-17	.94	.80
5	5-27	.52	.43	8-24	.35	.24
6	6-2	.40	.36	8-31	.26	.20
7	6-30	3.91	3.52	9-22	.22	.14
8	7-7	2.68	2.57	9-28	.13	.08
9	7-14	3.20	2.88	10-5	.48	.42
10	7-27	2.05	1.96	10-15	.28	.21
11	8-3	1.78	.86	10-19	.19	.17
12	8-10	4.48	4.16	10-26	2.05	.96
13	8-17	1.11	.82	11-2	.89	.74
14	8-24	.58	.41	11-9	.25	.20
15	8-31	.34	.31	11-15	.46	.33
16	9-16	.16	.10	11-22	.77	.54
17	9-22	.89	.75	11-30	.71	.52
18	9-28	.36	.42	12-7	1.62	.80
19	10-5	.38	.32	12-14	3.23	.83
				1977		
20	10-12	.27	.21	1-5	.93	.85
21	10-19	.25	.14	1-13	2.96	.68
22	10-26	.49	.40	1-19	1.17	.53
23	11-2	.52	.43	1-27	.77	.71
24	11-9	.43	.36	1-31	.77	.63
25	11-15	.64	.35	2-7	.64	.55
26	11-30	1.14	.90	4-20	1.04	.50
27	12-7	1.42	1.64	4-27	.64	.52
28	12-14	1.93	1.52	5-4	.51	.43
29	12-20	3.23	3.27	6-1	1.97	1.69
30	12-29	3.14	3.02	6-7	.65	.32
	1977					
31	1-5	3.29	2.81	6-14	.31	.23
32	1-13	2.75	2.59	6-21	.42	.31
33	1-19	2.88	2.99	Mean	.85	.49
34	1-28	1.87	1.56			
35	1-31	1.84	1.58			

APPENDIX TABLE F (Cont'd)

	Site 103 Deep Organic			Site 106 Shallow Organic		
Obs	Date	Total P	Ortho-P	Date	Total P	Ortho-P
	mg/l					
36	2-7	1.44	1.19			
37	2-16	.92	.96			
38	2-24	.69	.62			
39	3-2	1.09	.98			
40	4-14	1.12	.58			

	Site 102 Deep Organic		
	Date	Total P	Ortho-P
	mg/l		
41	4-1	2.48	2.48
42	4-20	.85	.60
43	4-27	.67	.46
44	5-4	.50	.43
45	6-1	2.89	2.91
46	6-7	2.18	2.05
47	6-14	1.11	.81
48	6-21	.68	.49
49	6-29	.86	.48
50	7-6	.37	.26
51	7-13	.26	.23
52	7-21	.21	.09
53	7-26	.20	.07
54	8-2	.22	.10
55	8-10	.20	.06
	Mean	1.26	1.10

Appendix Table G. pH and elemental concentration of each rainfall event collected at each of four sites. The data listed is day that sample was collected and rain is cumulative rain in cm since last sample was collected. All concentrations are in mg/l. A period in table indicates that value was missing or deleted by procedures given in body of report.

SITE=AF101

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TAN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
07/14/76	1	.	7.1	0.74	3.1	4.16	4.90	0.27	4.9	0.3	0.1	.	1.9	0.0	0.02	0.0	0.00	0.01
07/27/76	1	3.30	4.6	0.90	2.4	1.06	1.96	0.30	3.5	0.6	0.5	.	1.4	0.0	0.00	0.0	0.00	0.01
08/03/76	1	1.78	4.2	1.28	1.4	1.40	2.76	0.12	2.0	0.3	1.0	.	1.5	0.0	0.02	0.2	0.00	0.02
08/10/76	1	0.13	4.9	0.02	0.0	0.39	0.41	0.02	0.3	0.1	1.0	.	0.0	0.0	0.00	0.0	0.00	0.00
09/07/76	1	1.70	3.4	.	.	.	.	.	1.0	0.7	3.0	.	.	0.0	0.00	0.0	0.00	0.08
09/16/76	1	7.11	6.3	0.10	0.0	0.48	0.58	0.01	0.2	0.1	0.0	.	1.2	0.0	0.00	0.0	0.00	0.06
10/12/76	1	5.46	6.3	0.20	0.3	0.95	1.15	0.23	0.4	0.2	0.0	.	1.9	0.0	0.00	0.0	0.00	0.00
10/26/76	1	4.32	5.2	0.10	0.7	3.16	3.34	0.27	0.3	0.1	0.0	.	0.1	0.0	0.00	0.0	0.00	0.00
11/22/76	1	5.54	5.4	0.28	1.0	2.13	2.41	0.21	.	.	.	.	1.6	0.0	0.00	0.0	0.00	0.00
11/30/76	1	1.27	5.9	0.14	3.4	4.90	5.04	0.76	0.1	0.0	0.0	.	0.3	0.0	0.00	0.0	0.00	0.00
12/20/76	1	7.75	5.9	0.16	0.7	1.60	1.76	.	2.1	0.6	0.0	.	2.7	0.0	0.00	0.0	0.00	0.00
12/29/76	1	2.92	5.5	0.14	0.0	0.53	0.67	0.03	0.6	0.1	0.0	.	2.0	0.0	0.00	0.0	0.00	0.01
01/19/77	1	3.30	5.1	0.20	0.0	0.42	0.62	0.06	0.0	0.1	1.4	0.0	4.4	0.0	0.01	0.0	0.00	0.03
03/02/77	1	3.81	4.1	0.39	0.2	0.36	0.75	0.02	0.0	0.0	0.4	0.0	2.1	0.0	0.00	0.0	0.00	0.00
03/10/77	1	3.68	5.1	0.10	0.0	0.14	0.24	0.03	3.6	0.7	4.4	0.8	3.2	0.0	0.00	0.4	0.00	0.01
03/17/77	1	3.17	4.6	0.05	0.0	0.20	0.25	0.02	0.2	0.1	1.6	0.3	1.5	0.0	0.00	0.5	0.00	0.00
03/23/77	1	2.16	5.4	0.30	0.2	0.62	0.92	0.12	1.7	0.5	1.9	0.3	1.5	0.0	0.00	1.9	0.02	0.00
04/27/77	1	3.68	4.9	0.20	0.2	0.92	1.12	0.07	0.4	0.2	2.2	0.0	1.3	0.0	0.00	0.8	0.00	0.06
05/11/77	1	2.67	5.6	0.20	0.0	0.84	1.04	0.10	1.4	0.6	2.4	0.0	2.0	0.0	0.00	0.4	0.00	0.41
06/01/77	1	6.60	5.9	0.01	0.3	3.50	3.51	0.07	0.2	0.0	1.1	0.2	1.7	0.0	0.00	0.1	0.00	0.01
08/10/77	1	16.76	4.0	0.13	0.0	0.64	0.77	0.08	0.7	0.2	0.7	0.0	1.3	0.0	0.01	0.6	0.00	0.05
08/17/77	2	5.33	4.5	0.28	0.0	0.28	0.56	0.11	0.4	0.1	0.0	0.0	1.4	0.0	0.04	0.9	0.00	0.06
08/22/77	2	11.81	4.5	0.00	0.0	0.14	0.14	0.01	0.4	0.0	0.0	0.0	0.8	0.0	0.05	0.0	0.00	0.07
09/13/77	2	5.46	5.6	0.00	0.0	0.00	0.00	0.13	.	.	.	.	1.9	.	.	.	.	.
10/04/77	2	0.76	4.5	0.00	0.0	.	0.00	.	2.0	0.6	4.0	0.8	0.7	0.0	0.00	1.0	0.00	0.06
10/11/77	2	1.02	5.5	0.12	0.0	0.56	0.60	.	.	.	.	.	1.7	.	.	.	.	.
10/18/77	2	6.35	5.3	0.10	0.0	0.17	0.27	0.06	0.9	0.3	3.1	0.0	6.6	0.0	0.01	0.2	0.01	0.04
11/03/77	2	8.76	4.9	0.17	0.0	0.22	0.39	0.02	0.4	0.2	1.1	0.3	1.8	0.0	0.01	0.2	0.01	0.07
11/08/77	2	7.75	5.5	0.01	0.2	0.48	0.49	0.07	5.7	1.6	7.5	.	1.2	0.0	0.02	0.3	0.01	0.00
11/15/77	2	0.10	5.4	0.33	0.5	.	0.33	.	.	.	.	.	0.4	.	.	.	.	.
11/29/77	2	0.94	5.6	0.35	0.6	1.12	1.47	0.07	2.4	1.6	7.5	0.5	1.3	0.0	0.02	0.4	0.01	0.02
12/06/77	2	0.86	5.6	0.34	0.4	0.53	0.87	0.04	1.5	0.3	1.4	0.0	1.6	0.0	0.00	0.2	0.00	0.02
12/20/77	2	3.81	5.8	0.24	0.9	0.98	1.22	0.08	1.0	0.2	1.6	0.0	0.3	0.0	0.01	0.1	0.00	0.02
12/30/77	2	1.27	5.5	0.33	0.9	2.80	3.13	0.22	0.8	0.5	2.5	0.0	0.0	0.0	0.01	2.3	0.02	0.04
01/05/78	2	2.92	6.3	0.03	0.3	0.39	0.42	0.04	0.4	.	0.9	0.0	0.4	0.0	0.00	0.6	0.01	0.02
01/10/78	2	1.65	4.9	0.17	0.0	0.76	0.93	0.06	0.7	0.4	3.0	0.0	2.7	0.0	0.03	1.1	0.03	0.05
01/17/78	2	5.33	4.5	0.18	0.0	0.06	0.24	0.02	0.8	0.4	3.9	0.0	1.9	0.0	0.00	0.1	0.01	0.03
01/24/78	2	10.41	5.1	0.10	0.0	0.22	0.32	0.01	0.4	0.4	1.5	0.0	0.1	0.0	0.00	0.2	0.01	0.02
01/31/78	2	4.57	5.3	0.02	0.0	0.08	0.10	0.03	0.6	0.2	2.0	0.0	0.4	0.0	0.01	0.2	0.01	0.03
02/16/78	2	0.76	4.0	1.59	0.6	1.23	2.02	0.07	1.2	0.4	1.0	.	0.2	0.0	0.04	0.7	0.02	0.06
02/24/78	2	1.27	4.3	0.56	0.3	0.70	1.26	0.04	0.3	0.3	1.0	0.0	0.0	0.0	0.03	0.5	0.00	0.04
03/08/78	2	4.06	4.2	0.84	0.5	0.64	1.48	0.05	0.8	0.3	1.0	0.0	3.2	0.0	0.04	0.4	0.02	0.05
03/14/78	2	3.20	4.6	0.41	0.1	0.31	0.72	0.02	0.6	0.2	0.8	0.0	1.9	0.0	0.03	0.2	0.01	0.04
03/29/78	2	6.71	4.6	0.36	0.2	0.14	0.50	0.03	0.6	0.4	2.1	0.0	2.3	0.0	0.01	0.2	0.01	0.03
04/19/78	2	2.67	4.3	0.99	0.7	1.51	2.50	0.03	2.9	0.2	1.2	0.0	1.5	0.0	0.00	0.3	0.00	0.03
05/02/78	2	6.98	4.4	0.35	0.6	2.46	2.81	0.02	1.0	0.6	3.2	0.0	4.4	0.0	0.00	0.2	0.02	0.02
05/10/78	2	6.22	4.1	0.16	0.0	0.28	0.44	0.03	0.8	0.3	1.2	0.0	0.0	0.0	0.01	2.1	0.01	0.02
05/16/78	2	4.62	4.7	0.18	0.0	0.20	0.38	0.02	0.6	0.2	2.0	0.0	2.9	0.0	0.00	1.9	0.02	0.02
05/29/78	2	1.65	4.2	0.46	0.1	0.81	1.27	0.04	1.8	0.4	1.2	0.0	0.3	0.0	0.01	0.4	0.01	0.02
06/06/78	2	10.16	4.6	0.19	0.0	0.17	0.36	0.01	0.6	0.1	0.8	0.0	0.0	0.0	0.00	0.2	0.00	0.02
06/14/78	2	7.75	4.2	0.22	0.3	0.36	0.58	0.02	0.6	0.2	0.8	0.2	0.0	0.0	0.02	0.3	0.01	0.12
06/28/78	2	2.41	4.7	0.04	0.5	0.62	0.66	0.06	2.2	0.3	0.7	0.0	1.4	0.0	0.02	0.2	0.01	0.02
07/12/78	2	0.38	4.9	0.22	0.3	0.50	0.72	0.06	0.0	0.2	2.0	0.2	0.0	0.0	0.02	0.2	0.01	0.03
07/18/78	3	6.98	4.8	0.36	0.2	0.67	1.03	0.03	1.2	0.4	1.2	0.0	0.5	0.0	0.02	0.2	0.01	0.02
07/25/78	3	1.78	4.4	0.01	0.0	0.17	0.18	0.01	0.6	0.2	0.5	0.0	0.7	0.0	0.01	0.2	0.01	0.03
08/01/78	3	1.78	5.3	0.07	0.0	.	0.07	.	.	.	.	.	0.3	0.0	.	.	.	.
08/08/78	3	11.30	5.5	0.00	0.0	0.56	0.56	0.02	0.5	0.1	0.0	0.0	0.1	0.0	0.01	0.5	0.00	0.01

SITE=RF101

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
08/14/78	3	3.05	4.3	0.10	0.0	0.31	0.41	0.02	0.8	0.1	1.3	1.0	0.0	0.0	0.00	0.2	0.00	0.05
08/23/78	3	5.71	5.1	0.38	1.4	3.58	3.96	.	0.9	0.5	6.2	1.5	0.3	0.0	0.00	0.6	0.00	0.00
08/29/78	3	0.13	4.2	0.42	0.3	1.96	2.38	0.03	0.6	0.5	4.5	.	4.2	0.0	0.00	0.3	0.00	0.00
10/03/78	3	4.70	5.5	0.14	0.3	0.48	0.62	0.06	2.4	0.4	1.4	0.0	6.5	0.0	0.01	0.2	0.01	0.02
11/28/78	3	4.06	5.4	.	0.0	4.14	4.14	0.21	2.9	1.4	4.2	0.2	8.6	0.0	0.01	0.3	0.04	0.01
12/05/78	3	4.29	5.4	0.08	0.1	0.34	0.42	0.07	0.6	0.5	3.2	0.0	0.1	0.0	0.00	0.2	0.00	0.00
12/13/78	3	3.10	5.4	0.19	0.4	0.84	1.03	0.11	0.2	0.1	0.9	0.0	0.0	0.0	0.00	0.2	0.00	0.00
01/04/79	3	10.57	6.2	0.18	2.1	2.02	2.20	0.02	1.0	0.4	2.6	0.5	2.0	0.0	0.01	0.6	0.01	0.02
01/09/79	3	2.67	5.9	0.17	1.0	1.32	1.49	0.04	0.4	0.2	2.1	0.6	2.0	0.0	0.02	0.6	0.00	0.01
01/16/79	3	5.33	5.4	0.24	0.7	0.42	0.66	0.04	0.4	0.1	1.1	0.3	0.4	0.0	0.00	0.1	0.00	0.00
01/23/79	3	1.65	5.5	0.23	0.5	0.90	1.13	0.04	0.7	0.5	4.2	0.6	7.8	0.0	0.01	0.7	0.00	0.03
01/30/79	3	1.52	4.8	0.42	0.6	0.64	1.06	0.05	0.5	0.5	2.1	0.5	4.3	0.0	0.00	0.4	0.00	0.04
02/12/79	3	1.45	4.9	1.00	1.4	1.48	2.48	0.02	0.5	0.2	0.6	0.0	0.1	0.0	0.01	0.2	0.05	0.02
02/22/79	3	2.54	4.5	0.40	0.4	0.53	0.93	0.01	0.5	0.0	1.0	0.3	4.0	0.0	0.00	0.1	0.00	0.02
02/27/79	3	4.95	4.8	0.14	0.1	0.20	0.34	0.02	0.5	0.0	0.8	0.0	2.4	0.0	0.01	0.3	0.00	0.02
03/07/79	3	3.56	4.7	0.14	0.0	0.22	0.36	0.00	0.4	0.0	1.0	0.0	0.6	0.0	0.00	0.3	0.00	0.00
03/13/79	3	0.89	5.1	0.38	0.2	0.59	0.97	0.12	0.5	0.0	0.5	0.0	0.3	0.0	0.00	0.3	0.00	0.00
03/27/79	3	2.67	5.1	0.29	0.2	0.31	0.60	0.05	0.7	0.2	2.5	0.0	7.9	0.0	0.00	0.6	0.00	0.00
04/05/79	3	2.16	5.2	0.35	0.5	2.58	2.93	0.07	1.8	0.6	2.0	1.0	2.8	0.0	0.00	0.8	0.00	0.00
04/11/79	3	1.14	6.7	0.26	0.2	0.78	1.04	.	.	.	.	.	0.1	.	.	.	.	.
04/17/79	3	4.57	4.9	0.03	0.0	0.00	0.03	0.02	0.9	0.0	1.0	0.0	1.1	0.0	0.00	0.4	0.00	0.00
05/01/79	3	2.67	5.0	0.20	0.0	0.34	0.54	0.02	1.6	0.4	1.2	0.5	2.0	0.0	0.05	0.2	0.02	0.00
05/17/79	3	10.49	6.4	2.01	3.2	4.34	6.35	0.21	.	.	.	.	0.1	.	.	.	.	.
05/22/79	3	4.06	5.4	0.34	0.0	0.36	0.70	0.16	.	.	.	.	0.3	.	.	.	.	.
05/29/79	3	1.65	4.9	0.06	0.0	0.74	0.80	0.03	1.0	.	1.2	0.2	0.1	0.0	0.02	0.3	0.04	0.03
06/06/79	3	4.47	5.0	0.02	0.0	1.31	1.33	0.02	0.4	0.3	1.2	0.2	0.0	0.0	0.03	0.1	0.01	0.02
06/12/79	3	1.02	4.8	0.06	0.5	1.40	1.46	0.00	1.3	0.2	2.0	0.6	1.8	0.0	0.02	.	0.02	0.02
07/10/79	3	6.27	6.1	0.08	0.2	0.66	0.74	0.05	3.7	1.2	1.8	1.1	2.6	0.0	0.02	5.3	0.02	0.03
07/17/79	3	2.16	5.5	0.36	0.1	0.99	1.35	0.04	4.4	1.0	1.4	1.0	4.1	0.0	0.03	1.2	0.05	0.06
07/23/79	3	8.86	5.3	0.08	0.0	0.24	0.32	0.01	0.5	0.0	0.2	0.4	0.0	0.0	0.08	0.3	0.02	0.01

SITE=RF103

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
07/27/76	1	5.33	7.0	0.36	4.0	5.35	5.71	0.06	8.0	0.4	0.5	.	1.6	0.0	0.03	0.1	0.00	0.03
08/03/76	1	0.20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
08/10/76	1	5.31	7.2	0.24	4.0	7.25	7.49	0.54	5.4	0.4	0.5	.	1.3	0.0	0.00	0.0	0.00	0.03
11/22/76	1	18.67	6.0	1.06	2.0	.	1.06	.	16.5	1.5	6.0	.	15.8	0.0	0.02	0.0	0.00	0.03
03/17/77	1	21.44	5.0	0.13	0.2	0.90	1.03	0.24	2.3	0.7	2.0	0.5	3.3	0.0	0.04	2.1	0.03	0.20
03/23/77	1	2.03	5.5	0.30	0.4	1.04	1.34	0.11	2.2	0.6	1.3	0.9	1.5	0.0	0.00	0.9	0.00	0.08
06/14/77	1	22.48	5.7	0.53	2.9	3.86	4.39	0.43	4.9	1.3	6.2	0.7	3.6	0.0	0.07	3.2	0.02	0.15
06/29/77	1	2.41	4.4	0.84	0.1	0.84	1.68	0.07	2.5	0.2	0.0	0.5	1.8	0.0	0.03	0.4	0.00	0.08
07/05/77	1	5.21	6.0	0.41	2.9	5.74	6.15	0.46	6.7	0.8	0.4	1.4	1.1	0.0	0.03	3.0	0.02	0.04
07/26/77	1	0.13	5.6	0.00	5.3	13.58	13.58	.	4.4	0.8	0.4	.	5.3	0.0	0.03	1.5	0.02	0.09
08/02/77	2	1.65	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
08/10/77	2	1.27	5.7	0.57	1.2	2.88	3.45	0.52	2.4	0.4	1.0	0.0	2.3	0.0	0.03	0.6	0.00	0.09
08/17/77	2	1.78	6.6	0.32	2.4	3.64	3.96	0.65	2.7	0.5	0.0	0.0	5.1	0.0	0.06	0.7	0.00	0.09
08/22/77	2	4.57	4.9	0.10	0.0	0.70	0.80	0.13	0.9	0.1	0.0	0.0	1.0	0.0	0.00	0.6	0.00	0.05
08/30/77	2	0.76	4.5	0.55	0.0	2.80	3.35	0.03	.	.	.	.	2.9	.	.	.	.	.
09/13/77	2	6.60	4.9	0.15	0.2	0.70	0.85	0.09	0.4	0.1	1.5	0.0	1.6	0.0	0.01	0.2	0.00	0.02
10/04/77	2	0.76	6.3	1.07	0.8	7.98	9.05	0.60	.	2.7	3.0	3.0	6.5	0.0	0.06	.	0.08	0.11
10/11/77	2	1.40	5.7	1.12	1.1	2.80	3.92	0.03	5.0	0.6	1.0	1.0	5.2	0.0	0.00	0.7	0.01	0.05
10/18/77	2	4.95	5.4	0.53	0.2	1.62	2.15	0.15	2.4	0.6	1.5	0.0	2.6	0.0	0.00	1.0	0.01	0.05
11/03/77	2	9.02	5.5	0.30	0.4	1.62	1.92	0.14	1.1	0.3	2.5	0.0	5.1	0.0	0.02	0.7	0.00	0.03
11/08/77	2	7.11	5.7	0.11	0.3	0.84	0.95	0.06	1.3	0.2	2.0	0.2	1.4	0.0	0.01	0.1	0.00	0.01

Appendix G. (cont'd)

SITE=RF103

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
11/29/77	2	2.24	5.9	0.82	0.7	1.09	1.91	0.19	0.5	0.2	0.4	0.1	1.8	0.0	0.02	0.2	0.02	0.01
12/09/77	2	1.35	5.9	0.91	0.7	1.15	2.06	0.04	2.4	0.4	1.2	0.0	3.0	0.0	0.01	0.4	0.02	0.04
12/30/77	2	6.10	5.6	0.36	0.2	0.45	0.81	0.06	1.0	0.2	1.4	0.0	0.3	0.0	0.02	0.2	0.01	0.01
01/05/78	2	2.54	6.2	0.33	0.3	0.70	1.03	0.06	1.0	0.2	1.2	0.0	1.0	0.0	0.01	0.4	0.02	0.04
04/27/78	2	36.86	4.7	0.48	0.3	0.36	0.84	0.06	1.6	0.2	1.0	0.0	0.0	0.0	0.00	0.4	0.00	0.12
05/02/78	2	0.05	4.9	0.26	1.2	2.21	2.47	0.16	1.0	0.4	2.0	0.0	2.2	0.0	0.00	0.5	0.00	0.05
05/10/78	2	5.77	4.2	0.35	0.3	0.39	0.74	0.04	1.0	0.2	1.0	0.0	0.1	0.0	0.02	0.3	0.01	0.05
05/16/78	2	2.74	4.5	0.35	0.2	0.22	0.57	0.03	1.4	0.2	1.5	0.0	3.2	0.0	0.00	1.2	0.01	0.02
06/06/78	2	4.19	4.3	0.69	0.3	0.76	1.45	0.02	2.2	0.2	0.8	0.0	0.0	0.0	0.00	0.4	0.01	0.03
06/14/78	2	5.59	4.1	0.43	0.1	0.39	0.82	0.02	0.6	0.2	1.0	0.0	0.0	0.0	0.01	0.3	0.01	0.01
06/28/78	2	2.16	4.8	0.56	1.2	2.13	2.69	0.18	2.4	0.3	1.0	0.0	1.8	0.0	0.02	1.1	0.02	0.02
07/12/78	2	2.03	4.4	0.43	1.0	2.07	2.50	0.08	2.2	0.2	1.3	0.0	0.4	0.0	0.02	0.2	0.01	0.03
07/16/78	2	0.38	4.1	0.06	0.7	1.06	1.12	0.08	2.6	0.2	0.0	0.0	2.5	0.0	0.02	0.2	0.01	0.03
07/25/78	2	1.65	4.4	0.03	1.0	1.18	1.21	0.13	0.8	0.1	0.8	0.0	0.4	0.0	0.02	0.2	0.01	0.03
08/01/78	3	1.02	4.3	0.03	0.5	0.59	0.62	0.04	1.1	0.1	0.5	0.0	0.4	0.0	0.01	0.2	0.00	0.02
08/08/78	3	0.76	4.7	0.00	0.0	0.42	0.42	0.03	1.5	0.2	0.0	0.0	3.3	0.0	0.01	1.8	0.07	0.04
08/14/78	3	6.22	4.5	0.06	0.4	0.31	0.37	0.04	1.4	0.2	0.9	0.5	0.0	0.0	0.00	0.8	0.00	0.02
10/02/78	3	1.02	4.7	0.16	1.0	5.38	5.54	0.43	2.7	0.6	2.6	0.0	6.3	0.0	0.02	1.3	0.01	0.06
11/09/78	3	1.65	5.8	0.36	4.3	4.70	5.06	0.41	1.6	0.5	2.1	0.0	4.4	0.0	0.00	0.2	0.00	0.01
11/21/78	3	0.13	5.8	0.58	2.2	3.16	3.74	0.33	1.5	0.5	1.9	0.0	2.0	0.0	0.02	0.9	0.02	0.03
11/28/78	3	0.84	5.2	0.59	1.4	1.90	2.49	0.14	1.2	0.4	2.3	0.4	3.9	0.0	0.01	0.4	0.02	0.02
12/05/78	3	2.92	5.4	0.14	0.4	1.60	1.74	0.05	0.5	0.3	1.4	0.3	0.1	0.0	0.00	0.5	0.00	0.00
12/13/78	3	0.69	5.3	0.14	0.2	5.46	5.60	0.06	0.7	0.5	4.7	2.2	0.0	0.0	0.00	1.0	0.01	0.14
12/28/78	3	2.01	5.4	0.19	0.5	1.23	1.42	0.02	0.7	0.3	0.8	0.3	0.3	0.0	0.02	1.0	0.01	0.03
01/04/79	3	4.83	5.5	0.06	0.2	0.17	0.23	0.06	0.4	0.4	1.6	0.7	2.3	0.0	0.01	1.2	0.01	0.05
01/09/79	3	1.52	5.4	0.10	0.3	0.62	0.72	0.03	0.6	0.2	1.3	0.5	1.8	0.0	0.01	0.8	0.00	0.01
01/16/79	3	3.05	4.8	0.32	0.3	0.84	1.16	0.03	0.4	0.1	1.5	0.2	1.0	0.0	0.00	0.2	0.00	0.02
01/23/79	3	1.78	4.9	0.18	0.2	0.56	0.74	0.06	0.8	0.3	4.3	0.8	5.8	0.0	0.01	0.4	0.00	0.02
01/30/79	3	0.38	4.6	.	.	1.06	1.06	0.15	1.0	0.6	6.4	2.8	.	0.0	0.02	0.6	0.01	0.03
02/12/79	3	1.14	5.0	0.43	0.5	0.78	1.21	0.02	0.7	0.0	0.5	0.0	0.1	0.0	0.01	0.2	0.01	0.00
02/22/79	3	1.65	4.3	0.34	0.2	0.25	0.59	0.03	0.5	0.0	1.0	0.3	0.7	0.0	0.01	0.1	0.00	0.02
02/27/79	3	3.30	4.5	0.11	0.1	0.25	0.36	0.02	0.0	0.0	0.9	0.0	2.6	0.0	0.00	0.2	0.00	0.02
03/07/79	3	2.16	4.5	0.27	0.1	0.03	0.30	0.00	0.2	0.0	1.5	0.0	2.4	0.0	0.06	0.4	0.00	0.00
03/13/79	3	1.14	4.7	0.38	0.4	0.25	0.63	0.02	0.5	0.0	1.0	0.0	0.3	0.0	0.00	0.3	0.00	0.00
03/27/79	3	0.51	5.7	0.54	0.7	1.18	1.72	0.09	1.6	0.6	3.0	0.0	14.4	0.0	0.00	1.1	0.01	0.00
04/05/79	3	0.51	4.7	0.62	0.4	0.95	1.57	0.04	1.5	0.3	2.0	0.0	4.8	0.0	0.00	0.3	0.00	0.00
04/11/79	3	1.02	6.3	0.43	0.2	1.26	1.69	.	.	.	.	.	1.8	.	.	.	.	.
04/24/79	3	3.51	5.4	0.38	0.4	0.67	1.05	0.02	.	.	.	.	1.4	.	.	.	.	.
05/01/79	3	2.34	5.1	0.09	0.0	0.56	0.65	0.02	1.0	0.2	1.0	0.4	1.6	0.0	0.02	0.3	0.00	0.00
05/09/79	3	1.50	4.7	0.33	0.0	0.53	0.86	0.01	1.2	0.1	1.1	0.4	0.0	0.0	0.00	0.2	0.02	0.00
05/16/79	3	6.73	5.6	0.08	0.0	0.42	0.50	0.02	.	.	.	.	0.4	.	.	.	.	.
05/22/79	3	2.11	4.5	0.45	0.0	0.20	0.65	0.01	.	.	.	.	0.0	.	.	.	.	.
05/29/79	3	2.64	4.8	0.03	0.0	0.22	0.25	0.01	0.5	.	1.1	0.0	0.1	0.0	0.03	0.4	0.00	0.04
06/06/79	3	1.90	4.6	0.16	0.0	0.66	0.82	0.00	0.7	0.2	0.8	0.2	0.0	0.0	0.01	0.2	0.00	0.04
06/12/79	3	.	5.5	0.28	1.8	3.70	3.98	0.58	1.3	0.2	2.0	0.6	0.3	0.0	0.02	0.5	0.02	0.02
06/19/79	3	1.07	5.8	0.34	3.7	2.98	3.32	0.17	0.7	0.2	2.5	0.4	4.4	0.0	0.11	0.3	0.00	0.02
07/10/79	3	5.16	9.3	0.53	.	.	0.53	1.72	2.0	0.9	4.9	1.5	3.3	0.0	0.03	2.7	0.03	0.13
07/23/79	3	6.86	6.5	0.38	3.0	.	0.38	.	1.3	0.2	1.8	0.4	1.3	0.0	0.02	0.4	0.02	0.03

SITE=RF104

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
07/14/76	1	.	7.6	0.82	.	.	0.82	0.36	13.5	1.0	0.3	.	0.3	0.0	0.05	0.1	0.00	0.03
07/27/76	1	6.86	4.4	0.36	0.2	0.39	0.75	0.06	0.8	0.1	0.5	.	0.1	0.0	0.03	0.2	0.00	0.07
08/03/76	1	1.65	3.7	0.42	0.3	0.78	1.20	0.04	0.8	0.1	0.5	.	2.9	0.0	0.04	0.5	0.00	0.06
08/10/76	1	5.89	4.7	0.14	0.1	0.45	0.59	0.03	0.2	0.1	0.5	.	0.6	0.0	0.00	0.0	0.00	0.00
09/07/76	1	1.52	4.6	0.35	0.5	1.62	1.97	0.32	0.4	0.4	2.0	.	4.8	0.0	0.00	0.1	0.00	0.02
09/17/76	1	4.70	5.9	0.18	0.4	0.90	1.08	0.22	0.2	0.3	0.0	.	2.9	0.0	0.00	0.0	0.00	0.00
10/12/76	1	4.70	6.9	0.17	2.7	3.75	3.92	1.03	.	.	.	.	1.0	.	.	.	.	.
10/26/76	1	3.81	5.5	0.22	2.8	2.04	2.26	0.44	0.3	0.2	0.0	.	1.1	0.0	0.00	0.0	0.00	0.00
11/22/76	1	4.83	5.9	0.21	0.2	0.39	0.60	0.04	0.4	0.1	0.0	.	0.4	0.0	0.00	0.0	0.00	0.00
11/30/76	1	4.32	3.4	0.08	0.1	0.28	0.36	0.03	0.2	0.0	0.0	.	0.2	0.0	0.00	0.0	0.00	0.00
12/20/76	1	7.11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
01/04/77	1	2.92	3.6	0.83	.	.	0.83	.	1.0	0.0	0.0	.	1.9	0.0	0.00	0.3	0.03	0.03
01/13/77	1	4.93	4.3	0.31	0.0	0.00	0.31	0.05	0.0	0.1	1.7	0.0	3.5	0.0	0.03	0.0	0.02	0.03
01/19/77	1	1.90	4.4	0.09	0.0	0.28	0.37	0.03	0.0	0.1	1.0	0.0	3.2	0.0	0.01	0.0	0.02	0.00
03/02/77	1	2.03	4.5	0.41	0.2	0.36	0.77	0.04	0.7	0.1	2.0	0.0	2.2	0.0	0.00	0.2	0.00	0.03
03/10/77	1	3.56	4.7	0.16	0.1	0.14	0.30	0.04	7.5	1.7	9.7	2.0	3.0	0.0	0.00	0.1	0.00	0.26
03/17/77	1	2.41	4.9	0.06	0.0	0.34	0.40	0.03	0.2	0.0	1.3	0.2	2.6	0.0	.	0.2	0.00	0.00
03/23/77	1	2.92	5.7	0.25	0.2	0.76	1.01	0.09	1.1	0.2	1.7	0.2	2.5	0.0	.	0.7	0.00	0.04
05/11/77	1	7.37	4.3	0.57	0.5	0.84	1.41	0.05	0.8	0.1	1.0	0.7	0.6	0.0	0.00	0.2	0.00	0.32
06/01/77	1	11.05	4.9	0.06	0.0	0.28	0.34	0.04	0.6	0.1	0.3	0.0	1.8	0.0	0.00	0.1	0.00	0.03
06/14/77	1	1.40	4.0	0.50	0.0	1.90	2.40	0.12	1.4	0.2	1.3	0.0	1.7	0.0	0.00	0.4	0.00	0.04
06/29/77	1	2.41	6.2	0.46	4.4	10.08	10.54	1.47	2.0	0.6	2.8	1.0	3.3	0.0	0.01	0.8	0.01	0.06
07/13/77	1	8.76	4.2	0.00	0.0	1.54	1.54	0.16	0.1	0.1	0.0	0.0	0.7	0.0	0.00	2.1	0.03	0.03
07/26/77	2	0.76	3.6	0.78	0.7	1.82	2.60	0.16	1.5	0.2	0.0	0.8	2.2	0.0	0.01	0.5	0.02	0.08
08/10/77	2	1.78	4.4	0.67	0.6	1.20	1.87	0.26	.	.	.	.	5.6	.	.	.	.	.
08/17/77	2	7.62	4.8	0.08	0.0	0.28	0.36	0.04	0.1	0.0	0.0	0.0	1.6	0.0	0.05	0.2	0.00	0.04
08/22/77	2	8.00	4.3	0.07	0.0	1.12	1.19	0.01	0.0	0.0	0.0	0.0	0.7	0.0	0.00	0.1	0.00	0.14
09/13/77	2	9.91	8.3	0.26	4.1	6.30	6.56	0.66	1.0	0.2	2.0	0.0	2.8	0.0	0.02	0.2	0.00	0.02
10/04/77	2	1.90	5.2	0.18	0.2	3.92	4.10	.	3.8	0.4	1.5	0.5	5.4	0.0	0.00	0.5	0.01	0.03
10/11/77	2	1.40	5.8	0.19	0.8	0.84	1.03	0.40	2.3	0.2	1.0	0.5	4.0	0.0	0.00	0.3	0.01	0.03
10/18/77	2	6.98	4.5	0.18	0.0	0.28	0.46	0.04	0.3	0.2	1.0	0.0	1.8	0.0	0.00	0.3	0.00	0.02
11/03/77	2	10.67	6.0	.	.	3.39	3.39	0.02	0.2	0.1	1.4	0.0	.	0.0	0.01	0.1	0.01	0.04
11/08/77	2	10.41	5.6	0.02	0.3	0.00	0.02	0.04	2.1	0.3	1.0	0.0	0.0	0.0	0.01	0.1	0.00	0.02
12/06/77	2	3.28	5.5	0.39	0.6	0.64	1.03	0.06	2.6	0.5	1.1	0.0	2.8	0.0	0.01	0.1	0.01	0.01
12/20/77	2	6.02	5.1	0.26	0.0	0.20	0.46	0.02	1.0	0.2	1.5	1.1	0.3	0.0	0.01	0.2	0.00	0.01
04/27/78	2	50.01	5.4	0.44	0.3	0.25	0.69	0.05	3.0	0.3	1.2	0.0	1.6	0.0	0.01	0.6	0.01	0.40
05/02/78	2	0.05	4.5	0.26	0.2	0.56	0.82	0.06	1.1	0.4	1.2	0.0	0.8	0.0	0.00	0.4	0.00	0.15
05/10/78	2	8.43	4.3	0.19	0.2	0.50	0.69	0.02	0.8	0.2	1.8	0.0	0.6	0.0	0.01	0.3	0.01	0.05
05/16/78	2	2.54	4.7	0.30	0.0	0.36	0.66	0.03	0.6	0.2	2.5	0.0	2.5	0.0	0.00	2.6	0.01	0.05
05/29/78	2	4.06	3.9	0.80	0.6	1.01	1.81	0.03	0.6	0.2	1.5	0.0	1.1	0.0	0.00	0.4	0.01	0.10
06/06/78	2	5.97	4.1	0.51	0.3	0.53	1.04	0.01	4.2	1.7	2.5	0.5	0.0	0.0	0.00	.	.	0.21
06/14/78	2	6.17	4.1	0.42	0.2	0.45	0.87	0.04	0.4	0.2	0.9	0.0	0.0	0.0	0.01	0.4	0.01	0.03
07/12/78	2	4.83	4.2	0.22	0.2	0.50	0.72	0.06	1.8	0.2	1.2	1.8	3.1	0.0	0.02	0.2	0.02	0.07
07/17/78	3	2.41	4.6	0.02	0.0	0.28	0.30	0.13	1.0	0.2	2.0	0.0	0.1	0.0	0.03	0.1	0.02	0.02
07/25/78	3	9.40	4.1	0.04	0.0	0.36	0.40	0.01	0.4	0.1	1.2	0.0	0.2	0.0	0.00	0.2	0.01	0.03
08/01/78	3	1.65	4.6	0.02	0.0	0.11	0.13	0.01	0.4	0.1	0.0	0.0	0.2	0.0	0.01	0.1	0.00	0.06
08/08/78	3	8.13	5.4	0.00	0.4	0.98	0.98	0.09	0.8	0.2	1.5	0.0	0.1	0.0	0.01	0.3	0.01	0.03
08/14/78	3	9.91	4.6	0.05	0.0	0.28	0.33	0.04	0.4	0.1	1.0	0.5	0.0	0.0	0.00	0.2	0.00	0.06
10/02/78	3	[illegible].83	5.3	0.24	1.3	1.32	1.56	0.36	1.6	0.2	1.2	0.0	2.5	0.0	0.01	0.3	0.01	0.04
11/09/78	3	2.72	4.2	0.46	0.4	0.64	1.10	0.08	1.4	0.3	1.1	0.0	2.6	0.0	0.01	0.2	0.01	0.02
11/21/78	3	1.07	4.2	0.40	0.2	0.36	0.76	0.25	1.1	0.2	1.6	0.0	0.4	0.0	0.01	0.2	0.02	0.01
11/28/78	3	1.14	4.7	0.20	0.2	3.00	3.20	0.09	1.1	0.4	1.8	0.3	2.8	0.0	0.00	0.2	0.01	0.04
12/05/78	3	4.88	4.9	0.09	0.0	0.48	0.57	0.01	0.2	0.1	0.8	0.1	0.1	0.0	0.00	0.2	0.00	0.00
12/13/78	3	1.32	4.9	0.13	1.8	4.48	4.61	0.04	0.3	0.1	0.8	0.1	0.1	0.0	0.00	0.2	0.00	0.00
12/28/78	3	4.65	5.3	0.06	0.1	0.81	0.87	0.01	0.3	0.1	0.5	0.4	0.0	0.0	0.01	0.2	0.01	0.02
01/04/79	3	3.07	6.6	0.02	0.0	0.25	0.27	0.01	0.1	0.1	0.9	0.3	1.3	0.0	0.01	0.3	0.00	0.01
01/09/79	3	2.41	5.2	0.00	0.0	0.42	0.42	0.02	0.2	0.0	0.6	0.4	0.0	0.0	0.01	0.3	0.00	0.02

Appendix G. (cont'd)

SITE=RF104

DATL	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
01/16/79	3	5.03	4.7	0.14	0.0	0.22	0.36	0.02	0.1	0.1	0.5	0.1	0.1	0.0	0.00	0.2	0.00	0.01
01/23/79	3	1.90	4.6	0.01	0.0	0.50	0.51	0.08	0.4	0.2	2.7	0.4	3.9	0.0	0.01	0.3	0.00	0.00
01/30/79	3	2.03	5.1	0.05	0.0	0.17	0.22	0.08	0.5	0.2	0.9	0.1	1.2	0.0	0.01	0.3	0.01	0.00
02/12/79	3	1.98	4.6	0.40	0.1	1.34	1.74	0.05	0.4	0.0	1.3	0.0	0.1	0.0	0.02	0.4	0.00	0.01
02/22/79	3	4.44	4.5	0.13	0.0	0.34	0.47	0.02	0.1	0.0	1.3	0.1	3.7	0.0	0.02	0.1	0.00	0.02
02/27/79	3	5.26	4.5	0.08	0.0	0.20	0.28	0.02	0.0	0.0	0.7	0.0	0.0	0.0	0.00	0.2	0.00	0.02
03/07/79	3	3.28	4.4	0.10	0.0	0.28	0.38	0.05	0.0	0.0	1.0	0.0	1.4	0.0	0.00	0.1	0.00	0.00
03/13/79	3	0.76	4.7	0.19	0.0	0.34	0.53	0.02	.	.	.	.	0.2	.	.	.	.	.
03/27/79	3	2.16	4.8	0.11	0.0	0.56	0.67	0.02	0.6	0.2	2.0	0.0	4.4	0.0	0.00	0.2	0.00	0.00
04/05/79	3	3.30	5.0	0.38	0.1	0.42	0.80	0.05	1.1	0.2	1.5	0.0	2.2	0.0	0.00	0.2	0.00	0.00
04/11/79	3	0.84	5.2	0.12	0.1	.	0.12	.	.	.	.	.	0.3	.	.	.	.	.
04/17/79	3	4.19	4.9	0.00	0.0	0.00	0.00	0.21	0.4	0.0	0.5	0.0	0.1	0.0	0.00	0.2	0.00	0.00
05/01/79	3	3.53	4.7	0.28	0.1	0.06	0.34	0.04	1.0	0.2	0.8	0.2	0.9	0.0	0.03	0.2	0.00	0.00
05/09/79	3	1.37	4.5	0.29	0.0	0.28	0.57	0.02	0.8	0.1	0.8	0.4	0.0	0.0	0.01	0.2	0.00	0.00
05/16/79	3	5.03	4.8	0.26	0.0	0.36	0.62	0.03	.	.	.	.	0.2	.	.	.	.	.
05/22/79	3	1.70	4.5	0.38	0.0	0.48	0.86	0.03	.	.	.	.	0.1	.	.	.	.	.
05/29/79	3	2.03	4.5	0.26	0.0	0.45	0.71	0.06	0.7	.	0.8	0.2	0.1	0.0	0.03	0.2	0.04	0.03
06/06/79	3	2.84	4.6	0.25	0.1	0.73	0.98	0.05	0.7	0.3	1.0	0.2	0.0	0.0	0.02	0.2	0.00	0.03
06/12/79	3	1.70	5.2	0.20	0.2	0.28	0.48	0.03	0.5	0.0	0.7	0.4	0.2	0.0	0.00	0.1	0.00	0.01
06/19/79	3	1.02	6.6	0.21	0.1	0.88	1.09	0.07	1.0	0.2	1.8	0.2	2.8	0.0	0.03	0.2	0.00	0.01
07/10/79	3	6.25	4.2	0.33	0.2	0.55	0.88	0.03	1.0	0.2	1.4	0.6	0.2	0.0	0.03	0.6	0.03	0.04
07/31/79	3	6.10	4.3	0.29	0.1	0.64	0.93	0.01	1.0	0.1	0.0	0.0	0.1	0.0	0.03	0.2	0.03	0.01

SITE=RF106

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
08/03/76	1	5.16	6.9	0.50	0.9	1.76	2.26	0.12	5.7	0.9	2.0	.	2.8	0.0	0.02	0.0	0.00	0.04
08/10/76	1	8.25	6.3	0.00	0.0	0.36	0.36	0.05	2.3	0.4	0.5	.	0.2	0.0	0.00	0.0	0.00	0.00
10/12/76	1	10.67	6.8	0.23	0.6	0.90	1.13	0.51	0.8	0.5	0.0	.	2.0	0.0	0.00	0.0	0.00	0.00
11/09/76	1	6.86	5.9	0.19	0.5	1.54	1.73	0.28	0.8	0.3	0.0	.	3.8	0.0	0.00	0.0	0.00	0.00
11/22/76	1	4.19	5.9	0.31	0.4	0.78	1.09	0.05	0.8	0.2	0.0	.	0.1	.	.	.	.	.
11/30/76	1	2.16	4.5	0.14	0.4	0.56	0.70	0.04	0.6	0.1	0.0	.	0.3	0.0	0.00	0.0	0.00	0.00
12/29/76	1	9.65	6.0	0.10	.	2.80	2.90	.	0.5	0.1	0.0	.	2.0	0.0	0.00	0.0	0.00	0.00
01/13/77	1	4.70	5.2	0.19	0.2	0.22	0.41	0.05	0.0	0.1	1.2	0.0	2.9	0.0	0.02	0.0	0.00	0.04
01/19/77	1	1.27	4.0	0.04	0.0	0.70	0.74	0.04	0.9	0.2	4.5	0.0	3.2	0.0	0.04	0.0	0.00	0.02
03/02/77	1	3.94	5.6	0.26	0.3	0.64	0.90	0.05	0.9	0.3	1.6	1.2	1.8	0.0	0.00	1.0	0.00	0.01
03/10/77	1	3.94	5.0	0.16	0.1	0.28	0.44	0.07	1.1	0.6	2.7	0.6	5.5	0.0	0.00	1.6	0.00	0.02
03/17/77	1	3.94	5.0	0.10	0.1	0.20	0.30	0.06	0.5	0.2	0.4	0.0	3.0	0.0	0.00	0.2	0.00	0.00
03/23/77	1	2.92	5.1	0.18	0.1	0.48	0.66	0.02	0.6	0.2	0.8	0.0	1.8	0.0	0.00	0.4	0.00	0.02
04/20/77	1	0.63	5.9	0.06	0.0	1.60	1.66	0.16	2.8	1.4	3.6	1.0	8.0	0.0	0.00	3.0	0.00	0.04
05/11/77	1	9.27	4.2	0.67	0.4	0.70	1.37	0.05	1.2	0.2	1.0	0.7	1.8	0.0	0.00	0.4	0.00	0.03
06/01/77	1	7.62	5.1	0.19	0.2	0.70	0.89	0.09	1.1	0.3	1.0	0.0	3.3	0.0	0.00	0.5	0.00	0.04
06/26/77	1	5.52	6.1	0.75	0.0	0.56	1.31	0.10	9.4	0.5	0.0	0.4	4.8	0.0	0.02	1.0	0.00	0.04
07/13/77	1	4.19	4.0	0.60	0.3	0.56	1.16	0.08	1.9	0.2	0.5	0.3	2.6	0.0	0.04	0.6	0.02	0.04
07/20/77	1	1.27	3.7	0.68	0.4	0.98	1.66	0.12	2.1	0.2	0.0	0.7	3.8	0.0	0.02	1.6	0.03	0.03
08/10/77	2	2.41	6.3	0.27	2.9	4.28	4.55	0.46	3.0	0.5	1.3	0.0	6.4	0.0	0.10	1.2	0.00	.
08/17/77	2	9.65	4.9	0.05	0.0	0.42	0.47	0.04	0.6	0.0	0.0	0.0	2.5	0.0	0.05	0.4	0.00	0.17
08/23/77	2	4.70	4.2	0.08	0.0	0.84	0.92	0.02	0.3	0.0	0.0	0.0	0.6	0.0	0.00	0.1	0.00	0.08
09/13/77	2	16.00	6.0	0.06	0.0	0.28	0.34	0.03	1.0	0.1	1.0	0.0	3.1	0.0	0.02	0.5	0.00	0.02
10/04/77	2	2.29	5.0	0.11	0.0	0.28	0.39	0.01	2.0	0.2	1.0	0.5	3.2	0.0	0.00	0.3	0.00	0.07
10/11/77	2	1.14	5.6	0.21	0.0	0.56	0.77	0.05	2.0	0.2	1.0	0.5	3.8	0.0	0.00	0.3	0.00	0.05
10/18/77	2	7.62	4.1	0.26	0.0	0.00	0.26	0.02	0.5	0.9	1.5	0.0	2.3	0.0	0.00	0.3	0.00	0.01
11/03/77	2	10.92	4.6	0.20	0.1	1.76	1.96	0.02	0.6	0.2	3.3	0.0	4.3	0.0	0.01	0.2	0.00	0.04
11/08/77	2	12.95	5.1	0.05	0.0	0.17	0.22	0.01	2.1	0.5	0.4	0.0	0.0	0.0	0.02	0.2	0.02	0.03
11/15/77	2	0.25	4.7	0.60	0.4	.	0.60	.	.	.	.	.	2.5	.	.	.	.	.

Appendix G. (cont'd)

SITE=RF106

DATE	YEAR	RAIN	PH	NO3_N	NH4_N	TKN	TOT_N	P	CA	MG	NA	K	CL	CD	CU	FE	MN	ZN
11/29/77	2	1.02	5.0	0.56	0.7	0.87	1.43	0.08	0.6	0.2	0.4	0.0	5.2	0.0	0.05	0.3	0.01	0.02
12/06/77	2	2.29	6.5	0.35	0.3	0.36	0.71	0.04	3.0	0.1	1.7	0.0	2.1	0.0	0.01	1.0	0.00	0.01
12/30/77	2	3.56	6.0	0.56	2.3	4.23	4.79	0.20	0.6	0.2	2.8	0.0	2.8	0.0	0.00	1.5	0.01	0.02
01/05/78	2	3.30	6.6	0.07	0.3	0.56	0.63	0.04	0.4	0.1	1.0	0.0	1.0	0.0	0.00	0.6	0.01	0.02
01/10/78	2	1.52	6.3	0.26	1.0	1.57	1.83	0.12	0.6	0.2	2.6	0.0	3.5	0.0	0.00	0.3	0.00	0.02
01/17/78	2	5.08	435	0.37	0.6	0.28	0.65	0.04	0.7	0.4	3.6	0.0	1.2	0.0	0.00	0.2	0.09	0.03
01/24/78	2	10.06	4.6	0.18	0.2	0.42	0.60	0.02	0.3	0.3	2.3	0.0	2.2	0.0	0.00	0.1	0.01	0.01
01/31/78	2	3.51	5.5	0.04	0.2	1.37	1.41	0.03	0.3	0.2	1.6	0.0	1.3	0.0	0.00	0.5	0.01	0.02
02/16/78	2	0.91	4.0	0.83	0.5	0.67	1.50	0.07	0.7	0.2	1.0	0.0	0.4	0.0	0.04	0.4	0.00	0.03
02/24/78	2	2.46	4.4	0.56	0.5	0.67	1.23	0.05	0.4	0.2	1.0	0.0	0.4	0.0	0.03	0.2	0.00	0.03
03/08/78	2	3.23	4.0	0.52	0.4	2.27	2.79	0.02	0.9	0.4	2.0	0.0	4.9	0.0	0.03	0.2	0.01	0.02
03/14/78	2	3.71	4.4	0.39	0.3	0.28	0.67	0.03	0.6	0.2	0.9	0.0	3.8	0.0	0.03	0.1	0.01	0.05
03/29/78	2	3.63	4.7	0.46	0.0	0.78	1.24	0.07	1.8	0.8	3.2	0.0	7.3	0.0	0.01	0.8	0.02	0.05
04/27/78	2	14.02	4.4	0.80	0.6	0.81	1.61	0.08	2.9	0.5	1.2	0.0	3.2	0.0	0.00	0.8	0.02	0.03
05/02/78	2	0.76	4.4	0.26	0.4	0.25	0.51	0.04	0.8	0.2	1.8	0.0	2.3	0.0	0.00	0.2	0.00	0.01
05/10/78	2	8.33	4.2	0.31	0.3	0.53	0.84	0.03	0.8	0.2	1.8	0.0	2.7	0.0	0.00	0.2	0.00	0.01
05/16/78	2	1.65	4.8	0.52	0.3	0.48	1.00	0.02	1.2	0.4	2.0	0.0	4.0	0.0	0.00	1.1	0.01	0.01
05/29/78	2	0.76	4.4	0.65	1.0	4.36	5.01	0.16	3.7	0.7	2.0	0.0	6.2	0.0	0.02	0.7	0.03	0.04
06/06/78	2	8.51	5.9	0.51	0.6	1.04	1.55	0.17	3.7	0.4	0.8	0.0	0.0	0.0	0.01	1.6	0.02	0.03
06/14/78	2	1.27	4.6	0.37	0.0	0.39	0.76	0.03	1.4	0.2	1.8	0.0	0.1	0.0	0.02	0.6	0.01	0.06
06/28/78	2	3.43	4.6	0.40	0.9	1.06	1.46	0.29	2.2	0.3	0.8	0.0	1.8	0.0	0.04	0.4	0.01	0.04
07/12/78	2	0.51	5.7	0.67	2.1	8.68	9.35	0.50	4.9	0.5	1.6	0.0	3.9	0.0	0.02	0.7	0.02	0.03
07/18/78	2	1.14	4.4	0.55	0.7	2.91	3.46	0.13	2.1	0.2	0.0	0.0	0.4	0.0	0.03	0.5	0.00	0.04
08/14/78	3	11.05	5.5	0.09	0.0	0.53	0.62	0.05	3.7	0.2	1.0	0.5	3.0	0.0	0.00	0.4	0.00	0.06
10/02/78	3	3.81	5.2	0.05	0.5	1.32	1.37	0.08	3.8	1.2	2.9	0.0	8.4	0.0	0.02	0.4	0.01	0.06
11/09/78	3	2.11	5.2	1.10	2.6	3.58	4.68	0.15	4.3	0.8	1.9	0.1	9.7	0.0	0.03	0.8	0.01	0.03
11/28/78	3	1.22	6.9	1.02	4.7	8.54	9.56	0.83	14.6	2.2	6.5	0.8	11.0	0.0	0.04	3.3	0.04	0.03
12/05/78	3	4.72	6.6	0.20	1.2	0.20	0.40	0.18	2.5	0.8	5.1	.	0.2	0.0	0.00	0.8	0.00	0.00
12/13/78	3	1.50	6.9	0.26	0.0	1.82	2.08	0.07	5.8	0.6	1.2	0.2	0.7	0.0	0.02	1.7	0.01	0.05
12/28/78	3	4.95	6.0	0.24	1.0	2.04	2.28	0.05	1.1	0.1	1.0	0.6	0.4	0.0	0.03	1.0	0.00	0.04
01/04/79	3	5.84	6.9	0.20	0.7	0.31	0.51	0.40	10.8	1.5	3.6	0.9	4.3	0.0	0.03	2.2	0.02	0.03
01/09/79	3	1.52	5.9	0.18	0.2	0.56	0.74	0.04	1.6	0.3	1.4	0.6	3.7	0.0	0.04	0.5	0.00	0.00
01/16/79	3	4.70	5.8	0.35	0.1	0.59	0.94	0.08	1.4	0.1	0.7	0.1	1.1	0.0	0.00	0.1	0.00	0.03
01/23/79	3	1.90	5.1	0.19	0.1	1.26	1.45	0.19	7.1	1.5	6.4	1.1	14.6	0.0	0.04	0.9	0.01	0.03
01/30/79	3	1.14	5.4	0.26	0.0	0.39	0.65	0.10	3.1	0.7	2.8	0.4	5.5	0.0	0.04	2.6	0.02	0.03
02/12/79	3	1.40	5.2	0.63	0.2	0.64	1.27	0.03	1.6	0.0	0.5	0.0	0.1	0.0	0.05	0.2	0.00	0.03
02/22/79	3	2.03	5.7	0.43	0.1	0.53	0.96	0.07	1.7	0.1	1.0	0.2	2.2	0.0	0.02	0.1	0.00	0.03
02/27/79	3	5.13	5.4	0.11	0.0	1.46	1.57	0.13	1.8	0.0	1.1	0.0	2.9	0.0	0.03	0.4	0.00	0.02
03/07/79	3	4.57	4.5	0.86	0.2	0.76	1.62	0.04	2.8	0.2	1.5	0.0	3.3	0.0	0.00	0.4	0.00	0.00
03/13/79	3	0.89	5.5	0.20	0.0	1.67	1.87	0.03	1.3	0.2	1.0	0.0	1.2	0.0	0.00	0.4	0.00	0.00
03/27/79	3	2.41	5.4	0.17	0.2	4.45	4.62	.	5.9	1.1	3.5	0.0	14.7	0.0	0.00	2.1	0.00	0.00
04/05/79	3	2.29	6.2	0.66	0.4	1.96	2.62	0.18	5.8	0.7	2.0	0.0	5.0	0.0	0.00	1.4	0.00	0.08
04/11/79	3	1.24	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
04/17/79	3	4.57	6.0	0.03	0.3	2.16	2.19	0.02	7.9	0.6	1.0	0.0	0.0	0.0	0.00	1.3	0.00	0.00
05/01/79	3	3.94	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
05/09/79	3	1.14	8.0	0.51	0.0	0.95	1.46	0.24	.	0.8	0.9	0.6	0.1	0.0	0.04	1.3	0.04	0.05
05/16/79	3	5.84	8.0	0.15	0.0	0.76	0.91	1.00	.	.	.	.	2.4	.	.	.	.	.
05/22/79	3	1.27	8.0	0.65	0.1	0.70	1.35	0.12	.	.	.	.	0.2	.	.	.	.	.
05/29/79	3	1.22	7.9	0.40	0.0	0.99	1.39	0.06	18.4	3.2	.	0.8	0.2	0.0	0.11	0.6	0.02	0.05
06/06/79	3	1.30	7.0	0.25	0.4	13.70	13.95	0.90	.	2.5	3.5	2.2	2.8	0.0	0.08	.	0.06	0.12
06/12/79	3	1.14	7.2	0.18	1.2	1.78	1.96	0.14	5.1	1.0	8.8	1.0	9.1	0.0	0.02	0.6	0.02	0.07
07/10/79	3	4.27	9.6	0.04	0.9	1.95	1.99	0.01	12.2	0.5	1.8	0.8	2.3	0.0	0.04	1.2	0.04	0.01
07/17/79	3	4.95	6.2	0.38	0.3	0.85	1.23	0.09	4.8	0.2	0.6	0.3	0.0	0.0	0.03	0.5	0.02	0.08
07/23/79	3	9.14	6.0	0.50	0.0	0.18	0.68	0.01	1.4	0.1	0.7	0.5	0.1	0.0	0.02	0.2	0.02	0.02

Appendix Table H. Means, Standard Error of Mean and Range of Chemical Analyses of rainfall by years and over all three years.

Site = RF101 7/14/76 to 7/23/79

VARIABLE	N	MEAN	STD ERROR OF MEAN	MINIMUM VALUE	MAXIMUM VALUE
H	87	0.00	0.00	0.00	0.00
PH	87	5.09	0.07	3.40	7.10
NO3_N	87	0.28	0.04	0.00	2.01
NH4_N	87	0.45	0.08	0.00	3.40
TKN	87	0.97	0.12	0.00	4.90
TOT_N	87	1.25	0.13	0.00	6.35
P	87	0.08	0.01	0.00	0.76
CA	87	1.18	0.12	0.00	5.70
MG	87	0.35	0.04	0.00	1.60
NA	87	1.75	0.18	0.00	7.50
K	87	0.18	0.03	0.00	1.50
CL	87	1.85	0.23	0.00	9.30
CD	87	0.00	0.00	0.00	0.00
CU	87	0.01	0.00	0.00	0.08
FE	87	0.47	0.08	0.00	5.30
MN	87	0.01	0.00	0.00	0.05
ZN	87	0.03	0.01	0.00	0.41

Site = RF103 7/27/76 to 7/23/79

VARIABLE	N	MEAN	STD ERROR OF MEAN	MINIMUM VALUE	MAXIMUM VALUE
H	69	0.00	0.00	0.00	0.00
PH	69	5.31	0.11	4.10	9.30
NO3_N	69	0.36	0.03	0.00	1.12
NH4_N	69	1.03	0.16	0.00	5.30
TKN	69	2.11	0.30	0.03	13.58
TOT_N	69	2.47	0.30	0.23	13.58
P	69	0.20	0.04	0.00	1.72
CA	69	1.99	0.29	0.00	16.50
MG	69	0.37	0.05	0.00	2.70
NA	69	1.58	0.17	0.00	6.40
K	69	0.37	0.07	0.00	3.00
CL	69	2.40	0.34	0.00	15.80
CD	69	0.00	0.00	0.00	0.00
CU	69	0.02	0.00	0.00	0.11
FE	69	0.64	0.08	0.00	3.20
MN	69	0.01	0.00	0.00	0.08
ZN	69	0.04	0.00	0.00	0.20

Site = RF 104 7/14/76 to 7/31/79

```
VARIABLE        N          MEAN       STD ERROR      MINIMUM      MAXIMUM
                                       OF MEAN        VALUE        VALUE
H              79          0.00         0.00          0.00         0.00
PH             79          4.86         0.10          3.40         8.30
NO3_N          79          0.25         0.02          0.00         0.83
NH4_N          79          0.35         0.09          0.00         4.40
TKN            79          0.95         0.17          0.00        10.08
TOT_N          79          1.20         0.17          0.00        10.54
P              79          0.12         0.03          0.01         1.47
CA             79          1.06         0.20          0.00        13.50
MG             79          0.21         0.03          0.00         1.70
NA             79          1.13         0.13          0.00         9.70
K              79          0.19         0.04          0.00         2.00
CL             79          1.43         0.16          0.00         5.60
CD             79          0.00         0.00          0.00         0.02
CU             79          0.01         0.00          0.00         0.05
FE             79          0.28         0.04          0.00         2.60
MN             79          0.01         0.00          0.00         0.04
ZN             79          0.04         0.01          0.00         0.40
```

Site = RF106 8/03/76 to 7/23/79

```
H              83          0.00         0.00          0.00         0.00
PH             83          5.56         0.12          3.70         9.60
NO3_N          83          0.34         0.03          0.00         1.10
NH4_N          83          0.47         0.08          0.00         4.70
TKN            83          1.45         0.22          0.00        13.70
TOT_N          83          1.79         0.23          0.22        13.95
P              83          0.13         0.02          0.01         1.00
CA             83          3.42         0.44          0.00        18.40
MG             83          0.52         0.06          0.00         3.20
NA             83          1.65         0.16          0.00         8.80
K              83          0.24         0.04          0.00         2.20
CL             83          3.07         0.33          0.00        14.70
CD             83          0.00         0.00          0.00         0.00
CU             83          0.02         0.00          0.00         0.11
FE             83          0.69         0.07          0.00         3.30
MN             83          0.01         0.00          0.00         0.06
ZN             83          0.03         0.00          0.00         0.17
```

Appendix H. (cont'd)

```
                              SITE=RF101    YEAR=1

VARIABLE        N         MEAN        STD ERROR       MINIMUM       MAXIMUM
                                       OF MEAN          VALUE         VALUE

H              21         0.00          0.00           0.00          0.00
PH             21         5.21          0.19           3.40          7.10
NO3_N          21         0.28          0.07           0.01          1.28
NH4_N          21         0.66          0.23           0.00          3.40
TKN            21         1.38          0.30           0.14          4.90
TOT_N          21         1.65          0.32           0.24          5.04
P              21         0.15          0.04           0.01          0.76
CA             21         1.17          0.30           0.00          4.90
MG             21         0.26          0.05           0.00          0.70
NA             21         1.03          0.26           0.00          4.40
K              21         0.08          0.04           0.00          0.80
CL             21         1.63          0.22           0.00          4.40
CD             21         0.00          0.00           0.00          0.00
CU             21         0.00          0.00           0.00          0.02
FE             21         0.23          0.10           0.00          1.90
MN             21         0.00          0.00           0.00          0.02

-------------------- SITE=RF101    YEAR=2 --------------------

H              32         0.00          0.00           0.00          0.00
PH             32         4.88          0.10           4.00          6.30
NO3_N          32         0.29          0.06           0.00          1.59
NH4_N          32         0.25          0.05           0.00          0.90
TKN            32         0.62          0.11           0.00          2.80
TOT_N          32         0.91          0.15           0.00          3.13
P              32         0.05          0.01           0.01          0.22
CA             32         1.30          0.21           0.30          5.70
MG             32         0.43          0.07           0.00          1.60
NA             32         2.28          0.35           0.00          7.50
K              32         0.04          0.02           0.00          0.50
CL             32         1.54          0.31           0.00          6.70
CD             32         0.00          0.00           0.00          0.00
CU             32         0.01          0.00           0.00          0.05
FE             32         0.50          0.10           0.00          2.30
MN             32         0.01          0.00           0.00          0.03

-------------------- SITE=RF101    YEAR=3 --------------------

H              34         0.00          0.00           0.00          0.00
PH             34         5.22          0.10           4.20          6.70
NO3_N          34         0.27          0.06           0.00          2.01
NH4_N          34         0.52          0.14           0.00          3.20
TKN            34         1.05          0.19           0.00          4.34
TOT_N          34         1.33          0.23           0.03          6.35
P              34         0.05          0.01           0.00          0.21
CA             34         1.09          0.16           0.20          4.40
MG             34         0.34          0.06           0.00          1.40
NA             34         1.71          0.23           0.00          6.20
K              34         0.37          0.07           0.00          1.50
CL             34         2.27          0.48           0.00          9.30
CD             34         0.00          0.00           0.00          0.00
CU             34         0.01          0.00           0.00          0.08
FE             34         0.58          0.16           0.10          5.30
MN             34         0.01          0.00           0.00          0.05
```

Appendix H. (cont'd)

```
                             SITE=RF103    YEAR=1

VARIABLE          N          MEAN      STD ERROR         MINIMUM        MAXIMUM
                                        OF MEAN           VALUE          VALUE

H                10          0.00         0.00            0.00           0.00
PH               10          5.95         0.29            4.40           7.20
NO3_N            10          0.42         0.10            0.00           1.06
NH4_N            10          2.58         0.58            0.10           5.30
TKN              10          4.89         1.22            0.84          13.58
TOT_N            10          5.31         1.17            1.03          13.58
P                10          0.31         0.06            0.06           0.54
CA               10          5.96         1.33            2.20          16.50
MG               10          0.71         0.13            0.20           1.50
NA               10          1.78         0.74            0.00           6.20
K                10          0.67         0.09            0.50           1.40
CL               10          3.67         1.41            1.10          15.80
CD               10          0.00         0.00            0.00           0.00
CU               10          0.03         0.01            0.00           0.07
FE               10          1.12         0.40            0.00           3.20
MN               10          0.01         0.00            0.00           0.03

-------------------------- SITE=RF103    YEAR=2 ------------------------------

H                25          0.00         0.00            0.00           0.00
PH               25          5.15         0.15            4.10           6.60
NO3_N            25          0.45         0.06            0.03           1.12
NH4_N            25          0.72         0.15            0.00           3.25
TKN              25          1.92         0.42            0.22           8.23
TOT_N            25          2.37         0.44            0.57           9.05
P                25          0.16         0.04            0.02           0.65
CA               25          1.75         0.22            0.40           5.00
MG               25          0.38         0.10            0.10           2.70
NA               25          1.14         0.14            0.00           3.00
K                25          0.20         0.13            0.00           3.00
CL               25          2.17         0.37            0.00           6.50
CD               25          0.00         0.00            0.00           0.00
CU               25          0.02         0.00            0.00           0.06
FE               25          0.50         0.06            0.10           1.20
MN               25          0.01         0.00            0.00           0.08

-------------------------- SITE=RF103    YEAR=3 ------------------------------

H                34          0.00         0.00            0.00           0.00
PH               34          5.23         0.16            4.30           9.30
NO3_N            34          0.28         0.03            0.00           0.62
NH4_N            34          0.80         0.20            0.00           4.30
TKN              34          1.44         0.26            0.03           5.46
TOT_N            34          1.71         0.27            0.23           5.60
P                34          0.19         0.07            0.00           1.72
CA               34          1.00         0.09            0.00           2.70
MG               34          0.27         0.04            0.00           0.90
NA               34          1.84         0.24            0.00           6.40
K                34          0.40         0.11            0.00           2.80
CL               34          2.19         0.48            0.00          14.40
CD               34          0.00         0.00            0.00           0.00
CU               34          0.01         0.00            0.00           0.11
FE               34          0.59         0.09            0.10           2.70
MN               34          0.01         0.00            0.00           0.07
```

Appendix H. (cont'd)

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                               SITE=RF104    YEAR=1

VARIABLE          N          MEAN       STD ERROR        MINIMUM        MAXIMUM
                                         OF MEAN          VALUE          VALUE

H                23          0.00          0.00           0.00           0.00
PH               23          4.86          0.23           3.40           7.60
NO3_N            23          0.31          0.05           0.00           0.83
NH4_N            23          0.57          0.24           0.00           4.40
TKN              23          1.21          0.44           0.00          10.08
TOT_N            23          1.52          0.45           0.30          10.54
P                23          0.21          0.07           0.03           1.47
CA               23          1.44          0.63           0.00          13.50
MG               23          0.25          0.08           0.00           1.70
NA               23          1.16          0.42           0.00           9.70
K                23          0.18          0.10           0.00           2.00
CL               23          1.84          0.27           0.10           4.80
CD               23          0.00          0.00           0.00           0.00
CU               23          0.01          0.00           0.00           0.05
FE               23          0.27          0.10           0.00           2.10
MN               23          0.01          0.00           0.00           0.03

------------------------- SITE=RF104    YEAR=2 ------------------------------

H                20          0.00          0.00           0.00           0.00
PH               20          4.91          0.23           3.60           8.30
NO3_N            20          0.32          0.05           0.02           0.80
NH4_N            20          0.47          0.20           0.00           4.10
TKN              20          1.21          0.35           0.00           6.30
TOT_N            20          1.52          0.35           0.02           6.56
P                20          0.13          0.04           0.01           0.66
CA               20          1.42          0.27           0.00           4.20
MG               20          0.29          0.08           0.00           1.70
NA               20          1.16          0.17           0.00           2.50
K                20          0.28          0.11           0.00           1.80
CL               20          1.89          0.37           0.00           5.60
CD               20          0.00          0.00           0.00           0.00
CU               20          0.01          0.00           0.00           0.05
FE               20          0.41          0.12           0.10           2.60
MN               20          0.01          0.00           0.00           0.02

------------------------- SITE=RF104    YEAR=3 ------------------------------

H                36          0.00          0.00           0.00           0.00
PH               36          4.82          0.09           4.10           6.60
NO3_N            36          0.17          0.02           0.00           0.46
NH4_N            36          0.15          0.06           0.00           1.80
TKN              36          0.64          0.14           0.00           4.48
TOT_N            36          0.81          0.14           0.00           4.61
P                36          0.06          0.01           0.01           0.36
CA               36          0.62          0.07           0.00           1.60
MG               36          0.14          0.02           0.00           0.40
NA               36          1.10          0.09           0.00           2.70
K                36          0.16          0.03           0.00           0.60
CL               36          0.91          0.22           0.00           4.40
CD               36          0.00          0.00           0.00           0.02
CU               36          0.01          0.00           0.00           0.03
FE               36          0.22          0.02           0.10           0.60
MN               36          0.01          0.00           0.00           0.04
```

Appendix H. (cont'd)

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                              SITE=RF106    YEAR=1

VARIABLE          N           MEAN         STD  ERROR         MINIMUM         MAXIMUM
                                            OF  MEAN           VALUE           VALUE

H                19           0.00            0.00            0.00            0.00
PH               19           5.33            0.22            3.70            6.90
NO3_N            19           0.28            0.05            0.00            0.75
NH4_N            19           0.27            0.05            0.00            0.90
TKN              19           0.86            0.15            0.20            2.80
TOT_N            19           1.14            0.16            0.30            2.90
P                19           0.10            0.03            0.02            0.51
CA               19           1.79            0.51            0.00            9.40
MG               19           0.36            0.07            0.10            1.40
NA               19           1.04            0.30            0.00            4.50
K                19           0.26            0.09            0.00            1.20
CL               19           2.83            0.44            0.10            8.00
CD               19           0.00            0.00            0.00            0.00
CU               19           0.01            0.00            0.00            0.04
FE               19           0.54            0.18            0.00            3.00
MN               19           0.00            0.00            0.00            0.03

---------------------------- SITE=RF106    YEAR=2 -----------------------------

H                33           0.00            0.00            0.00            0.00
PH               33           4.98            0.14            4.00            6.60
NO3_N            33           0.37            0.04            0.04            0.83
NH4_N            33           0.53            0.12            0.00            2.90
TKN              33           1.33            0.31            0.00            8.68
TOT_N            33           1.70            0.33            0.22            9.35
P                33           0.09            0.02            0.01            0.50
CA               33           1.46            0.21            0.30            4.90
MG               33           0.30            0.04            0.00            0.90
NA               33           1.45            0.16            0.00            3.60
K                33           0.03            0.02            0.00            0.50
CL               33           2.71            0.33            0.00            7.30
CD               33           0.00            0.00            0.00            0.00
CU               33           0.02            0.00            0.00            0.10
FE               33           0.51            0.07            0.10            1.60
MN               33           0.01            0.00            0.00            0.03

---------------------------- SITE=RF106    YEAR=3 -----------------------------

H                31           0.00            0.00            0.00            0.00
PH               31           6.31            0.20            4.50            9.60
NO3_N            31           0.35            0.05            0.03            1.10
NH4_N            31           0.51            0.17            0.00            4.70
TKN              31           1.94            0.49            0.18           13.70
TOT_N            31           2.30            0.50            0.40           13.95
P                31           0.18            0.05            0.01            1.00
CA               31           6.51            0.89            1.10           18.40
MG               31           0.86            0.15            0.00            3.20
NA               31           2.24            0.34            0.50            8.80
K                31           0.45            0.09            0.00            2.20
CL               31           3.60            0.76            0.00           14.70
CD               31           0.00            0.00            0.00            0.00
CU               31           0.03            0.00            0.00            0.11
FE               31           0.99            0.14            0.10            3.30
MN               31           0.01            0.00            0.00            0.06
```

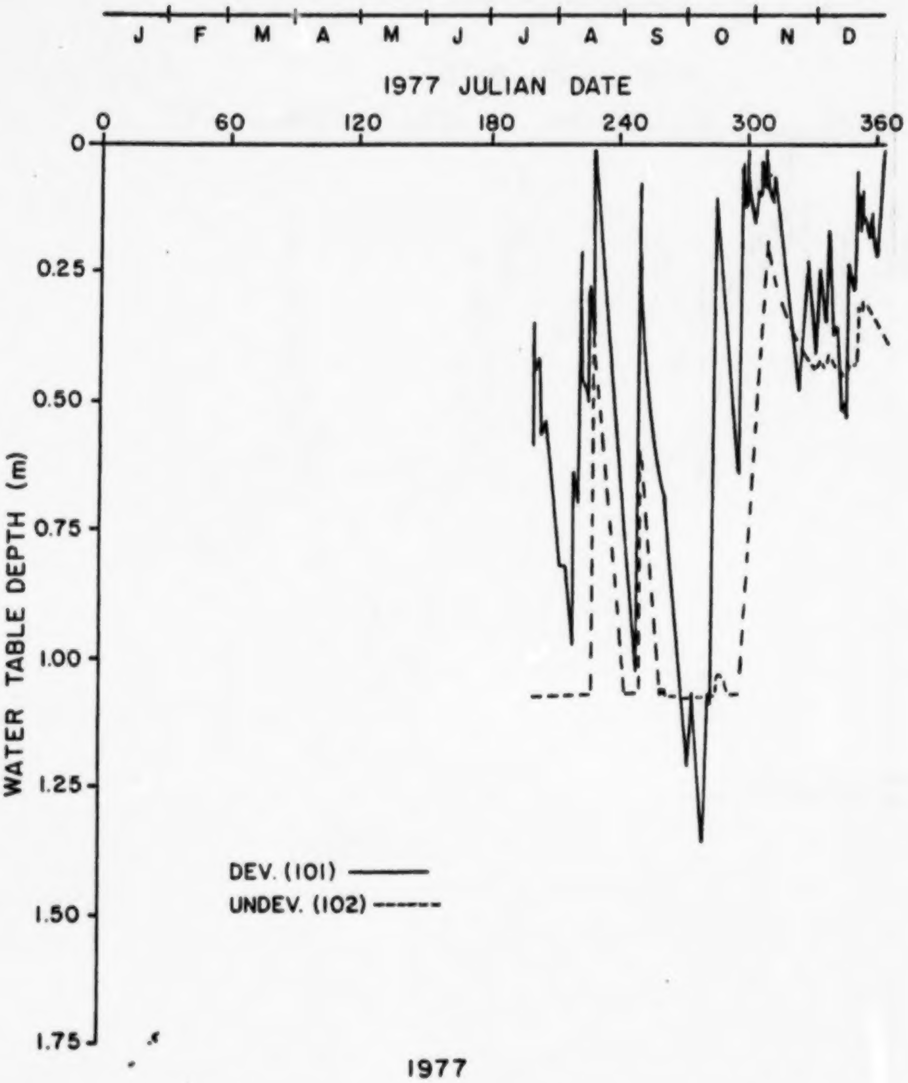

Figure A1. Water table depths midway between drainage ditches on developed and undeveloped mineral soils during 1977.

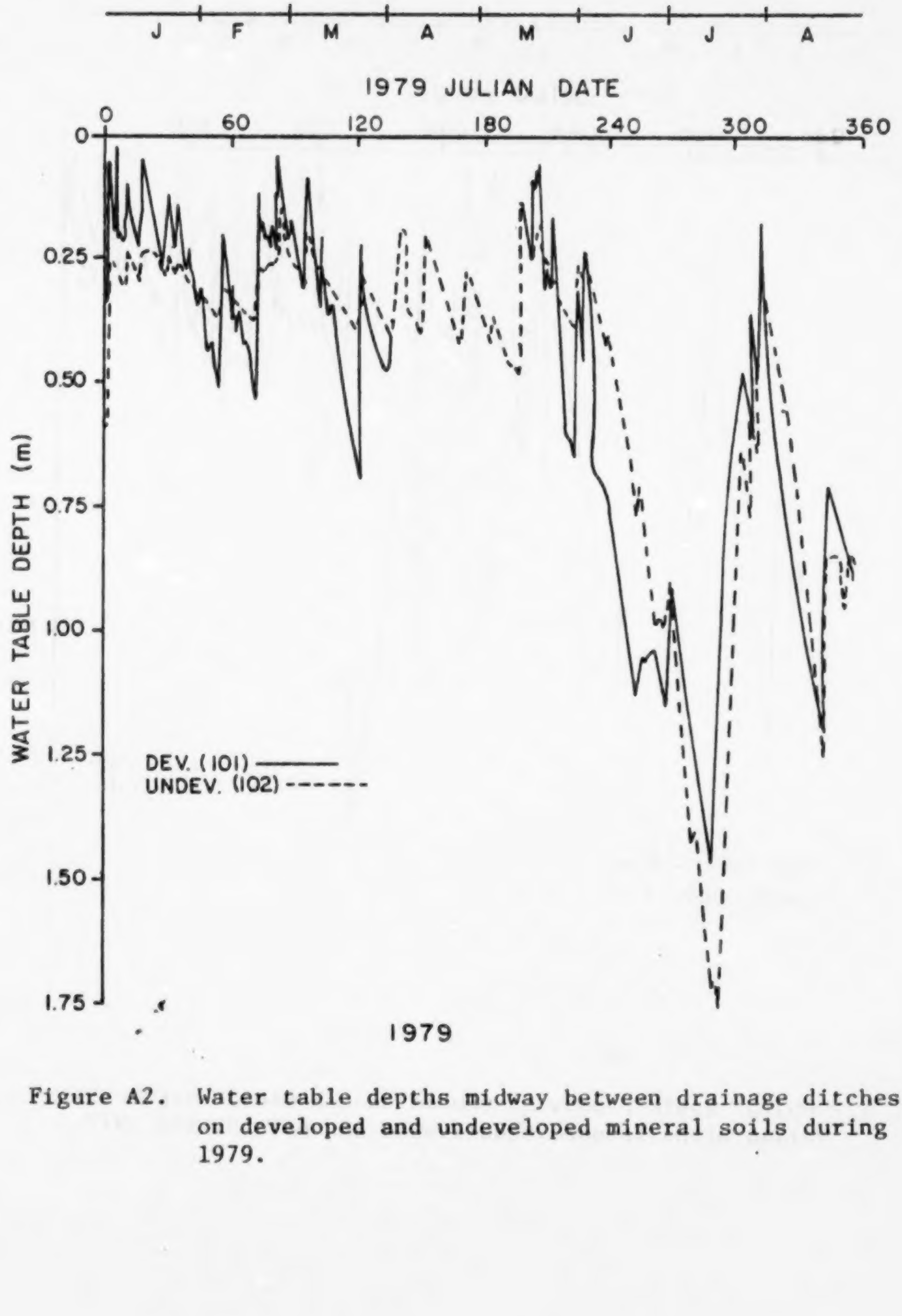

Figure A2. Water table depths midway between drainage ditches on developed and undeveloped mineral soils during 1979.

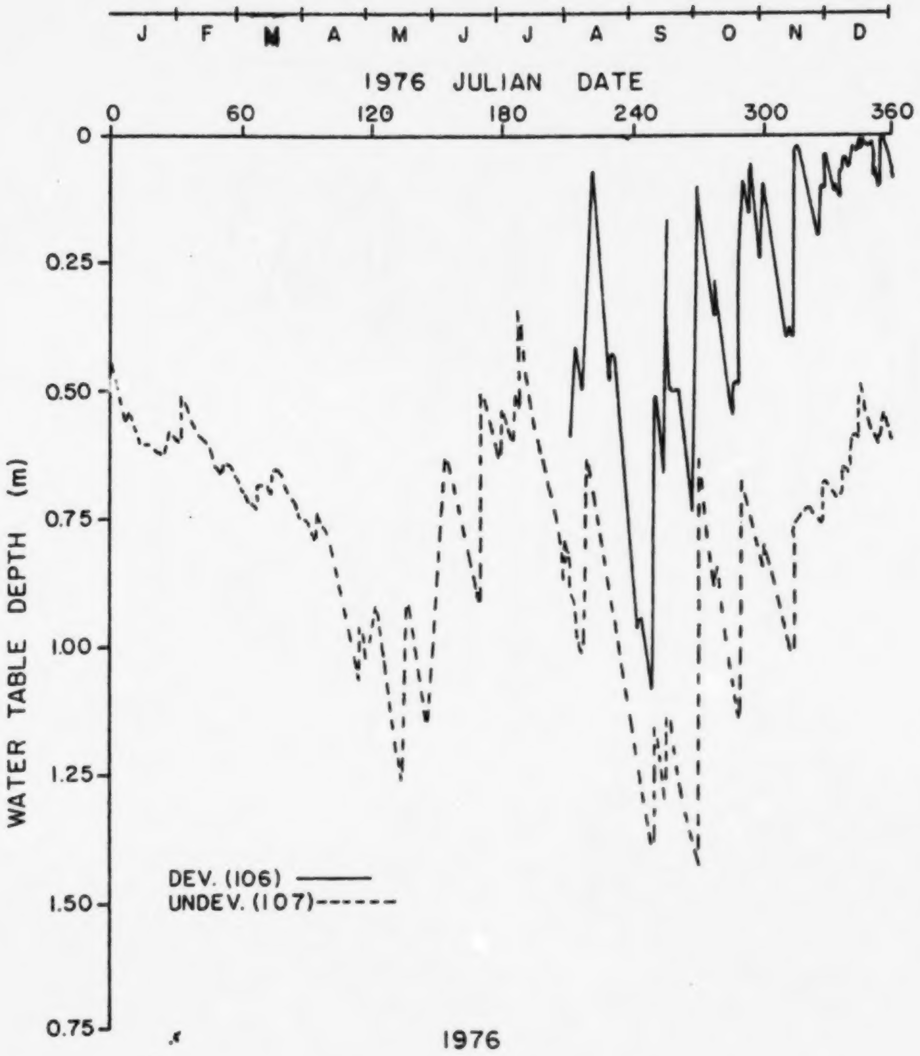

Figure A3. Water table depths midway between drainage ditches on developed and undeveloped shallow organic soils during 1976.

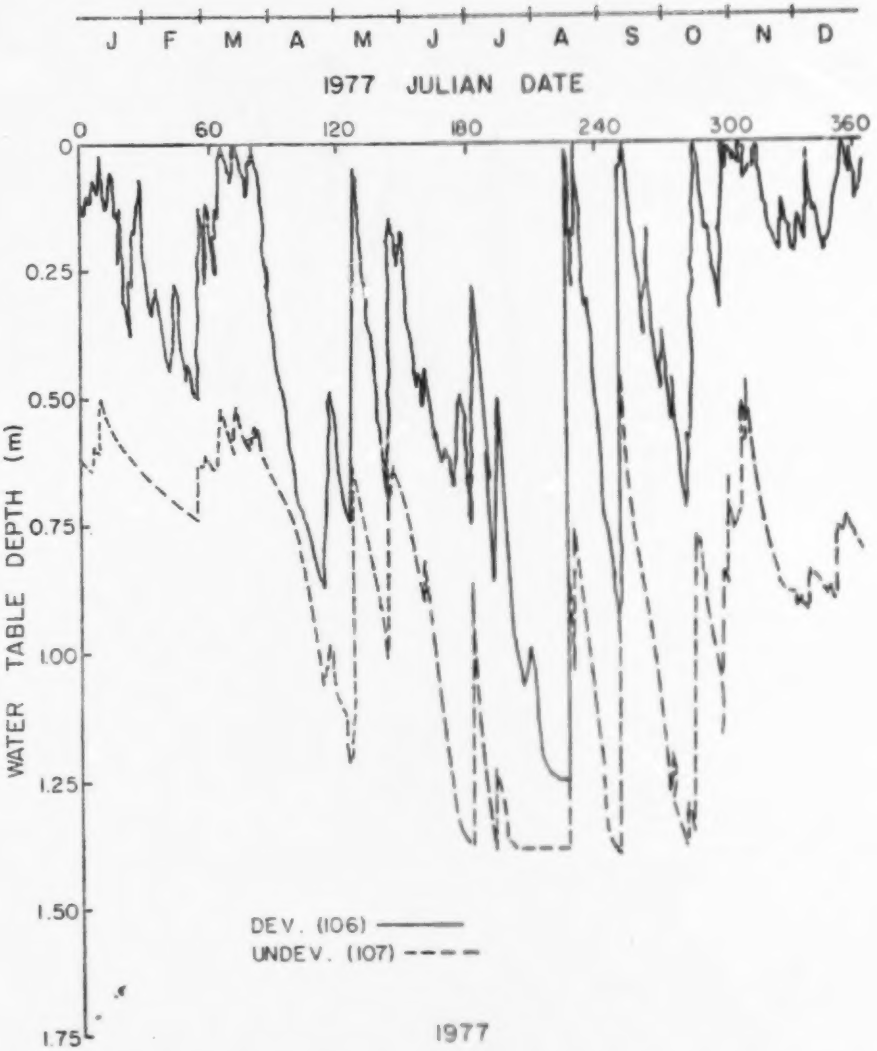

Figure A4. Water table depths midway between drainage ditches on developed and undeveloped shallow organic soils during 1977.

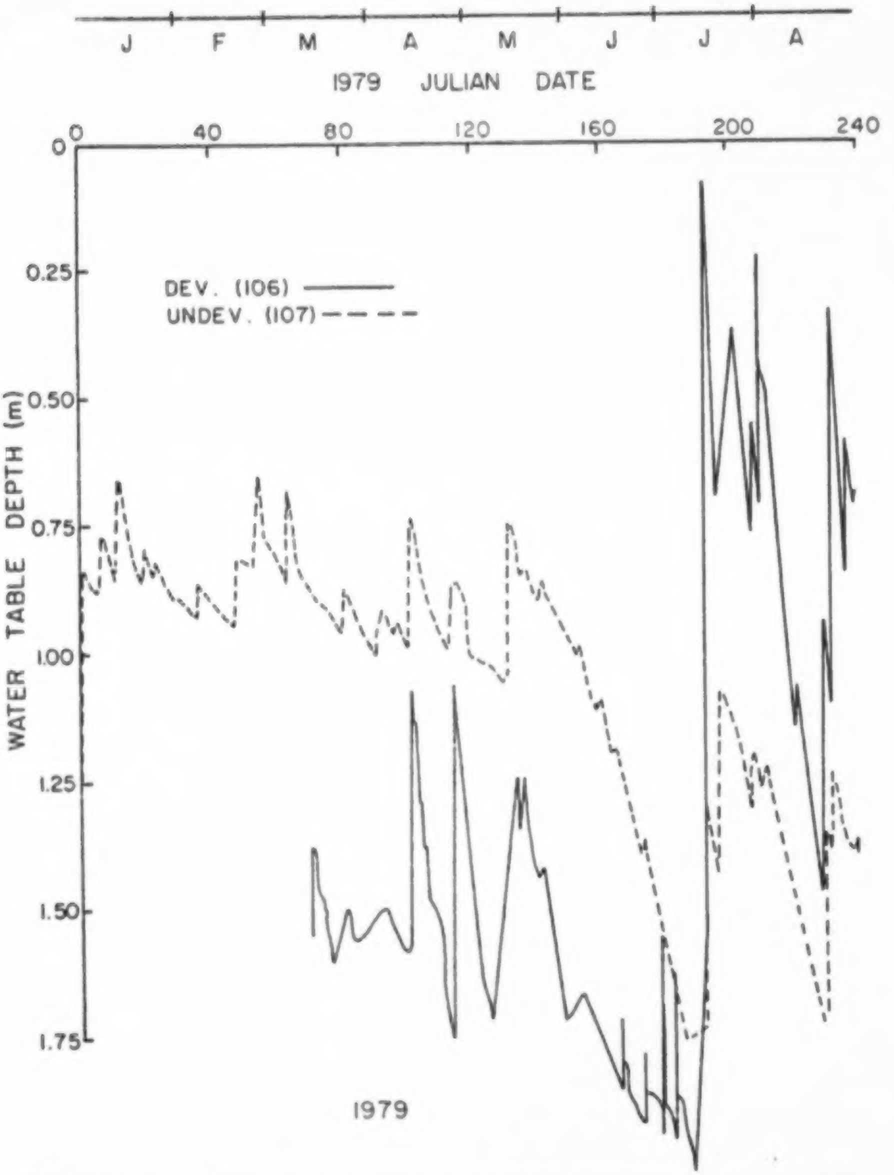

Figure A5. Water table depths midway between drainage ditches on developed and undeveloped shallow organic soils during 1979.

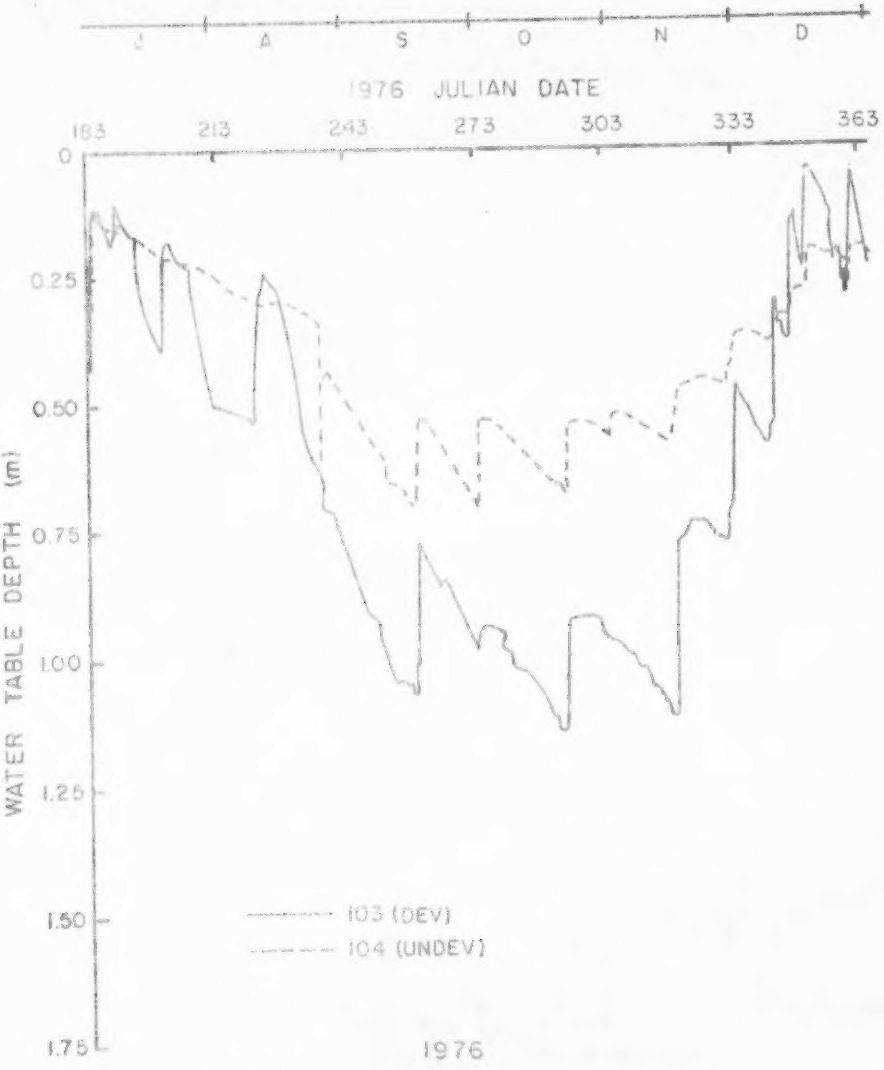

Figure A6. Water table depths midway between drainage ditches on the developed deep organic site and in the center of the 130 ha undeveloped site during 1976.

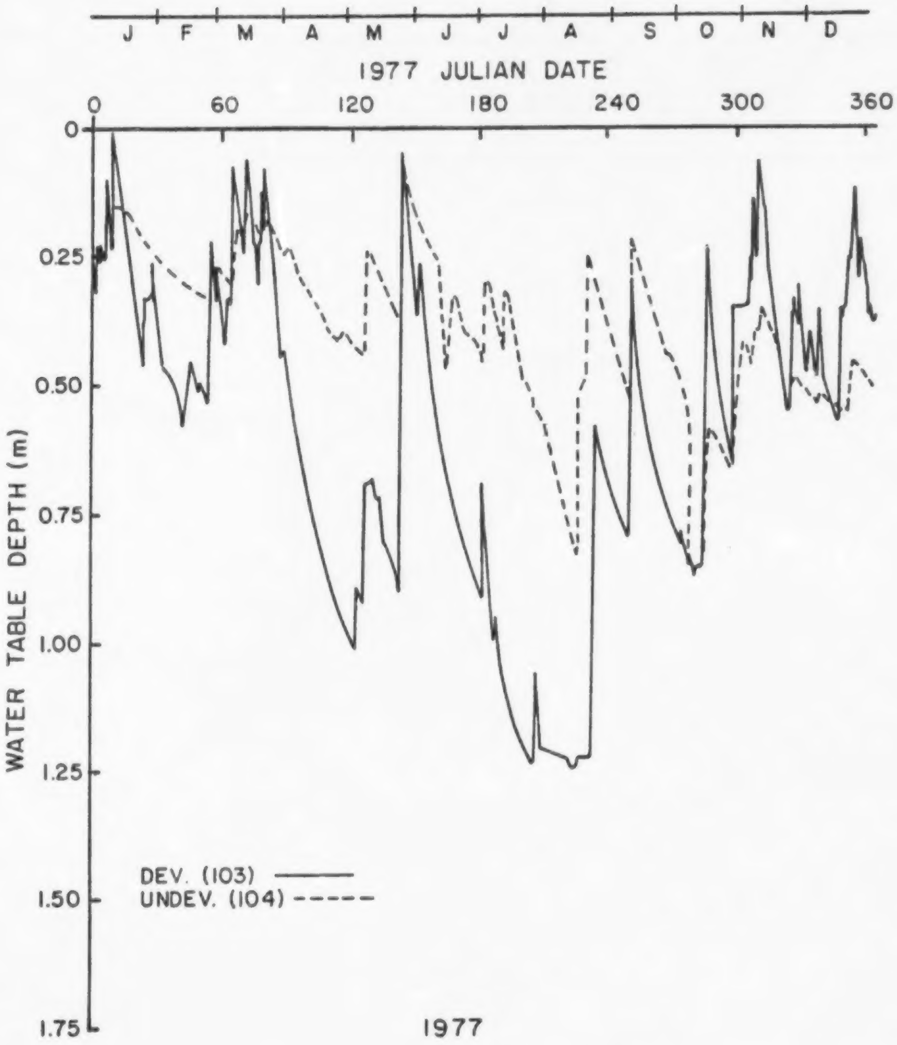

Figure A7. Water table depths midway between drainage ditches on the developed deep organic site and in the center of the 130 ha undeveloped site during 1977.

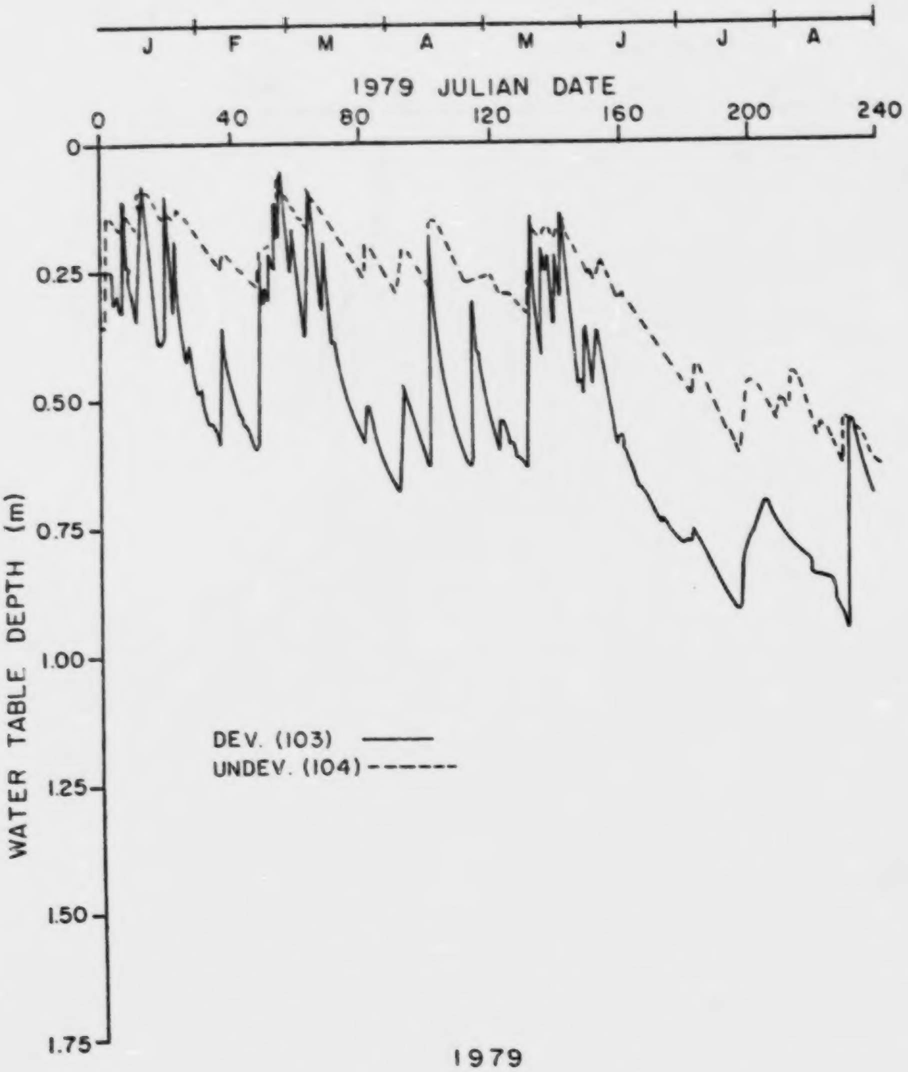

Figure A8. Water table depths midway between drainage ditches on the developed deep organic site and in the center of the 130 ha undeveloped site during 1979.